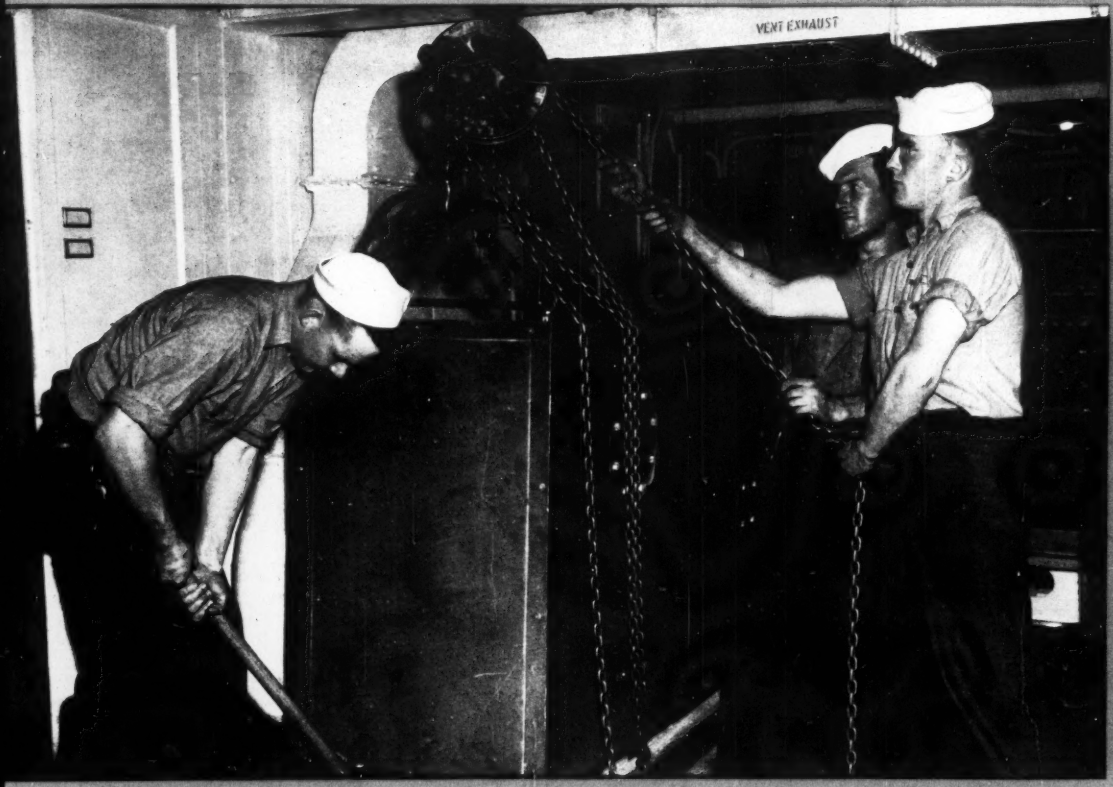
Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

JULY ★ 1952

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

Page 117—Journal Section of The American Society of Heating and Ventilating Engineers



"Mothball Fleet" pays off. This official U. S. Navy photo shows a dehumidifier being removed from a ship being activated ..... page 92

Why Factories Are Air Conditioned 86

Making Piping Flexibility Analyses 78

New Heating for 185 Year Old Building 82

Complete Contents This Issue 5

AIR CONDITIONING THE NATIONAL POLITICAL CONVENTIONS 73

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

NO. 4 OF A SERIES SHOWING THE GRINNELL LINE

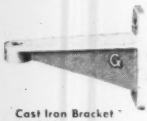
BRACKETS, HOOKS, CLAMPS for attachment to walls, columns and beams

Light Welded Steel Bracket
fig. 194
max. load: 750 lb.

Medium Welded Steel Bracket
fig. 195, max. load: 1500 lb.
heavy welded steel bracket
fig. 199, max. load: 3000 lb.

Side Beam Bracket
fig. 202
load: 150 to 2300 lb.

Side Column Bracket
fig. 203
load: 150 to 390 lb.



Cast Iron Bracket
fig. 223
load: 610 lb.

Cantilever Bracket
fig. 221
with angle iron ext.
fig. 222

Single Hook
fig. 168
½ to 3 IPS

One Hole Clamp
fig. 126
⅜ to 4 IPS

FLANGES, CLIPS, HOOKS for attachment to the ceiling

Adj. Swinging Hanger Flange
fig. 155, for ⅜ to ⅞ in. rod
flange only
fig. 156, for ¾ to 12 in. pipe

Swivel Hanger Flange
fig. 154
for ⅜ to ⅞ in. rod

Pipe Hanger Flange
fig. 153
for ⅜ to ⅞ in. rod

Ceiling Flange
fig. 128
for ⅛ to ¾ IPS

Adj. Clip Base
fig. 116
for ¾ to 2 in. pipe
⅜ in. rod size

Wrought Clip, Long
fig. 263
short, fig. 262
½ to 4 in. pipe

Tin Clip
fig. 231
¼ to 2 in.

U Hook
fig. 205
¾ to 8 in. pipe

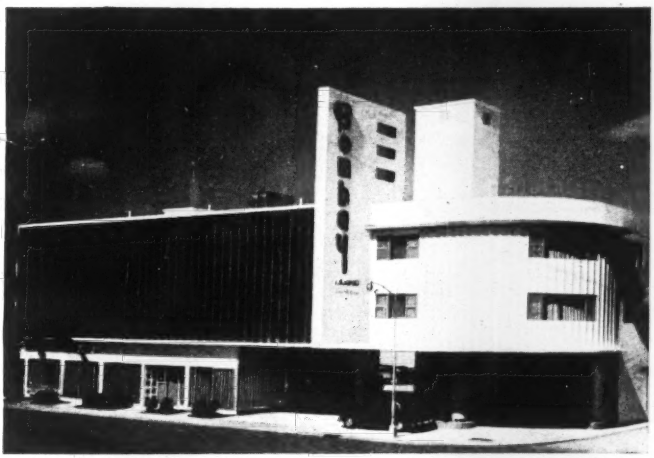
Call Your Local Grinnell Distributor or write for Hanger Catalog.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

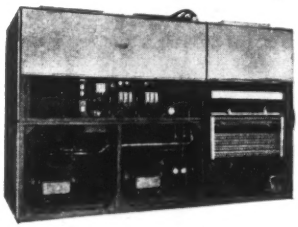


Arch: **Norman M. Giller**, *Contr:* **Hamilton Constr. Co.**, *Air Cond. Contr.:* **Airko Air Cond.**

Beautiful 100 Room Miami Hotel Air Conditioned by 3 Central Station Packaged Units

Bombay Hotel system arranged for either of two conditioners to handle second or third floor rooms with other unit shut down

Architect Norman Giller had an eye to maximum economy of operation when he specified 3 USAIRCO DRK (Dual Circuit Refrigerated Kooleraire) units for the Bombay Hotel in Miami Beach, Florida.



One 30 H.P. DRK cools the Bombay's lobby, card room, cocktail lounge and coffee shop. A 40 H.P. DRK and another 30 H.P. DRK cool the 100 guest rooms in this show place structure of Miami Beach. Each DRK unit consists of air conditioner, compressor and evaporative condenser sections all combined in this one integrated assembly.

Installation was made so that either of the two room-cooling DRKS can handle second or third floor rooms with the other unit shut down. This arrangement is particularly advantageous when the number of guests is reduced and only one floor of rooms is occupied.

Seasonal load variations present no problem because the DRK is wired with a two-stage thermostat, which automatically operates one or both compressors. Circuit design provides maximum dehumidification at either full or partial load.

DRK units are custom fabricated at the factory and are available in 7 sizes, from 10 to 50 H.P.

●

See your nearest USAIRCO agent or write to Dept. HP 752

UNITED STATES AIR CONDITIONING CORP.
3300 Como Ave. S.E.
Minneapolis 14, Minn.

USAIRCO

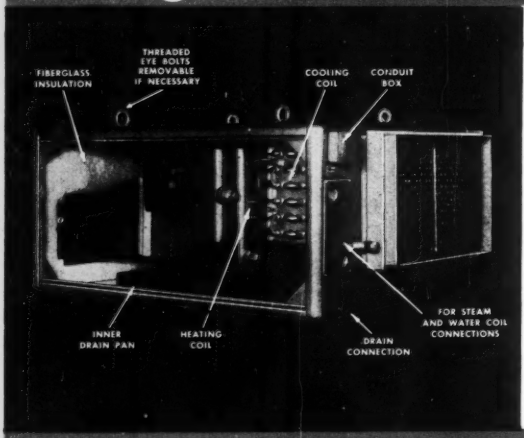
AGENTS

Alabama, Birmingham—Edwin B. Miller, 3648 Clairmont Avenue
California, Los Angeles 7—Harry F. Haldeman, Inc., 2401 South Hill Street
San Francisco 7—Refrig. & Power Spec. Co., 380 Brannan Street
Colorado, Pueblo—George G. Miller, 1011 East 11th Street
D. C., Washington—George F. Miller, 1902 L Street, N. W.
Florida, Jacksonville—Florida Air Control Co., 624 West Bay Street
Georgia, Atlanta—William F. Applegarth, 426 W. Peachtree N. W.
Idaho, Boise—Thermal Engineering Co., 1301 Wilson
Illinois, Chicago 1—E. J. Conley Company, 35 East Wacker Drive
Rockford—R. E. Burden, 6610 North Second
Iowa, Des Moines—R. G. Siple, 214 Plymouth Bldg.
Kentucky, Louisville 13—Harry A. Ropke & Assoc., 1025 Oriole Court
Louisiana, New Orleans—Lamatt Agency, Inc., 840 Baronne Street
Maryland, Baltimore—The Dexter Co., 2021 Maryland Ave.
Massachusetts, Wakefield—E. A. Seeley, Inc., 116 Foundry Street
Michigan, Detroit 11—J. H. Keller Company, 2832 E. Grand Boulevard
Kalamazoo—J. Daniel Rupert, 2540 Wellington Road
Minnesota, Minneapolis 2—George Mellema Co., 620 Plymouth Building
Mississippi, Jackson—Lamatt Agency, Inc., 2840 Arbor Hills Drive
Missouri, St. Louis 17—T. J. Waddell, 1110 So. Brentwood Blvd.
Montana, Billings—Lefler Wyomont Supply Co., 234 Stapleton Building
Nebraska, Omaha—Ak-Sar-Ben Sales Co., 1309 Leavenworth Street
New Jersey, Newark 2—Air & Heat Company, 1060 Broad Street
New Mexico, Albuquerque—Air Equipment Co., 1607 North 2nd Street
New York, Albany—Avery M. Walsh & Sons, P. O. Box 974
Buffalo 17—R. C. Chellus, 31 Palmer Avenue, Kenmore
New York City 17—Air & Heat Company, 420 Lexington Avenue
Syracuse—Avery M. Walsh & Sons, Box 502
North Carolina, Charlotte—Charles M. Setzer Co., P. O. Box 1867
Marion—Charles M. Setzer Co., P. O. Box 623
Ohio, Cincinnati 12—B. E. Culbertson Co., 626 Broadway
Cleveland 2—T. R. Eberwine Co., 13231 Euclid Avenue
Oklahoma, Oklahoma City—Don R. Groth, 342 Oklahoma Natural Building
Oregon, Portland—H. K. Mead Company, 317 S. W. Alder Street, Room 1100
Pennsylvania, Harrisburgh—Thermal Spec. Co., 212 Locust Street
Philadelphia 3—Malloy & Company, Broad Street Station Building
Wilkes-Barre—Luzerne & Lackawanna Supply, 20 N. Pennsylvania Avenue
South Carolina, Greenville—Charles M. Setzer Co., P. O. Box 203
Tennessee, Memphis—Lamatt Agency, Inc., 1482 Madison Street
Nashville—Reube O. Emery, Third National Bank Building
Texas, Dallas 2—Buffalo Engineering Company, Santa Fe Building
Fort Worth 2—J. D. Higgins Co., 822 Neil P. Anderson Building
Houston 6—Jack Thomas Davis, 3303 Montrose Boulevard
San Antonio—R. M. Dawson, 516 Maverick Building
Utah, Salt Lake City—Thermal Engineering Co., 1672 East 13th Street
Virginia, Richmond—American Sales Engineers, 1222 Bainbridge Street
Washington, Seattle—George E. Mead Company, 501 Arctic Building
Spokane—Francis J. Fallquist, 507 Kuhn Bldg.
West Virginia, Charleston—Allegheny Equip't Co., 715 Richard Street and NYCRR
Wisconsin, Milwaukee 11—Joseph S. Babush Co., 2401 North Maryland Avenue
Canada, Toronto—Creamery Package Mfg. Co. of Canada, Ltd., 267 King Street
Honolulu, Hawaii—H. Z. Colvin, 1325 Kamaile Street
Export Department—13 East 40th St., New York 16, N. Y.

Economy Market
New Brighton, Pa.

Contractor, Valley Refrigeration
New Brighton, Pa.

These Bush conditioners make a market "Super"



Shop in comfort, work in comfort. Economy Market of New Brighton, Pa., offers conditioned air to customers and employees alike.

Six row deep Bush Comfort Conditioners handle the comfort cooling requirements of an average of 300 people per hour. For the heating season two row hot water coils in each unit provide a convenient and economical heating system.

For offices, stores, shops, beauty parlors, restaurants, transportation terminals, taverns, the Bush Comfort Conditioner is the ideal solution to the problem of high quality, low cost air conditioning.

Bulletin 530, free upon request, contains complete data.

Bush Manufacturing Company

WEST HARTFORD 10, CONNECTICUT

Heating Piping & Air Conditioning

Vol. 24, No. 7

JULY 1952

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

BOARD OF CONSULTING AND CONTRIBUTING EDITORS . . . .

N. R. Bernz, Leo F. Collins, Sabin Crocker, R. C. Doremus, Philip Drinker, M. K. Fahnestock, Walter L. Fleisher, F. E. Giesecke, William Goodman, William A. Hanley, J. J. Harman, G. W. Hauck, R. S. Hawley, E. P. Heckel, R. E. Hieronymus, J. C. Hornung, Lee P. Hynes, C. W. Kimball, Dwight D. Kimball, A. C. Kirkwood, Charles S. Leopold, Samuel R. Lewis, H. C. Murphy, Alfred J. Offner, F. B. Rowley, Robert P. Schoenijahn, Kalman Steiner, T. S. Tenney, Rush D. Touton, Eph. A. Tyler, W. H. Wilson

EDITOR . . . . C. M. BURNAM, JR.

ASSOCIATE EDITOR . . . . THOMAS V. JOHNSON

ASSISTANT EDITOR . . . . AILEEN H. BURNS

ADVERTISING STAFF . . . .

Wallace J. Osborn and Robert J. Osborn, New York—Murray Hill 9-8293 . . . . Robert A. Jack, Cleveland—Evergreen 2-1840 . . . . James D. Thomas and George C. Cutler, Chicago—State 2-6916 . . . . R. P. Wettstein, Los Angeles—Dunkirk 8-2286, Portland—Atwater 4107, San Francisco—Yukon 6-2522

PUBLISHER . . . . FRANK P. KEENEY

MANAGER . . . . CHARLES E. PRICE

CIRCULATION DIRECTOR . . . . FRANK S. EASTER

PRODUCTION MANAGER . . LAWRENCE A. DOYLE

Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1952 issue unavailable. For change of address, notify publisher and your local postoffice of both old and new addresses by the 15th of the preceding month. Member Audit Bureau of Circulations and Associated Business Publications, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc.

Copyright 1952 by the Keeney Publishing Co.

Entered as Second Class Matter May 18, 1929 at the Post office at Chicago, Ill., U.S.A. under the Act of March 3, 1879. Additional entry at Mendota, Ill.

Features

Air Conditioning Aids Choice of Next President 73
Air Recovery Revamps Heating System 77
Making Piping Flexibility Analyses 78
Old House to New Museum 82
Birth Rate Means Construction Boom 85
Why Manufacturing Plants Are Air Conditioned 86
Device Locates Piping Corrosion 91
"Mothball Fleet" Pays Off 92
Put Headers and Valves Handy 96
Building Managers Meet 98
Analyzing Pipe Line Networks 100
HPACCNA Annual Convention 104
Hot Radiography for Piping Installation 105
Applying Mineral Wool Pipe Insulation 106
How Flow Obstruction Was Overcome 108
Electromagnetic Pump 113
Standards for Stainless 5S Pipe 114

Departments

The Editor's Pages (news and notes) 65
"Open for Discussion" (comment and criticism) 69
The Law and Your Profits (banked check may mean loss) 109
Question of the Month (doorway air curtain) 110
Data Sheet (dimensions, weights of pipe) 115
Sam Lewis' Page (garage heating problem) 116
Equipment Developments (new products) 197
Who's What (names in the news) 232
New Books and Reports (sources of information) 248
Meetings and Conventions (who, where and when) 252
Recent Trade Literature (manufacturers offer data) 254
Index to Advertisers (in this issue) 272

ASHVE Journal Section

Drying Atmospheric Air for a Supersonic Wind Tunnel 117
W. E. Emley, Jr.

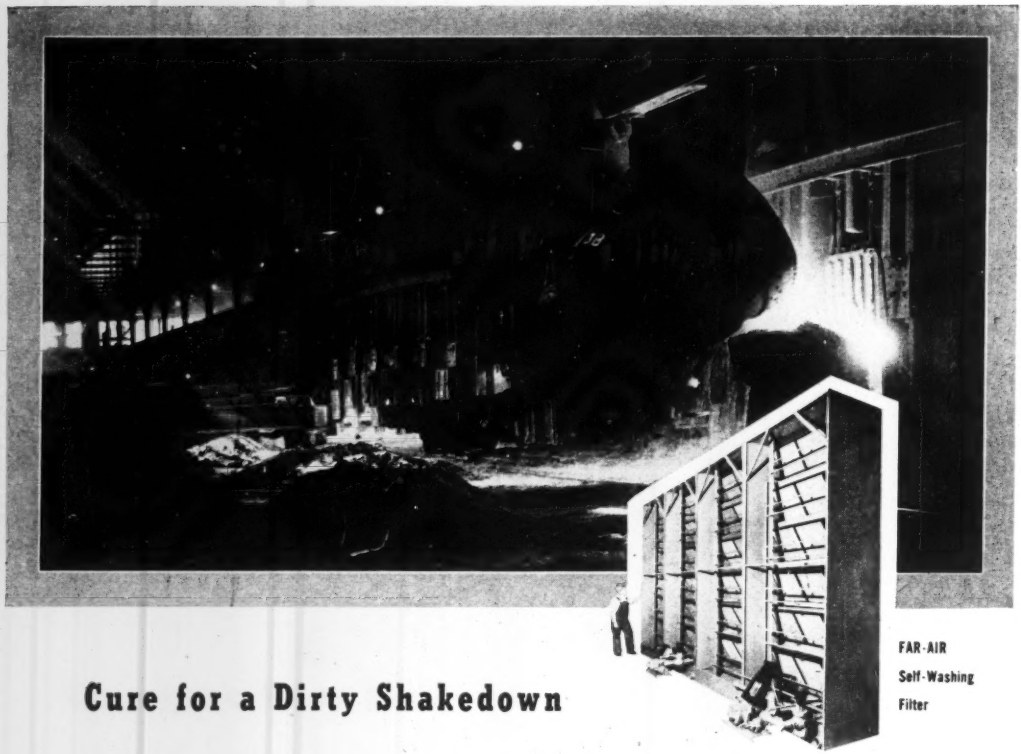
Smoke-Filaments for Study of Room Air Distribution 123
H. B. Nottage, J. G. Slaby and W. P. Gojsza

Status of the Heat Pump in the Southeast 126
S. L. Pappas and F. R. O'Brien

Summary of Chapter Meetings 131

Candidates for Membership 144

Officers, Council and Committees 147



FAR-AIR Self-Washing Filter

Cure for a Dirty Shakedown

Twice each day it was necessary for a large Eastern steel producer* to shakedown his furnaces. This caused high concentrations of dirt which resulted in severe air filter maintenance and inefficient air conditioning.

FARR Company, when called upon for a permanent solution, recommended a FAR-AIR** Self-Washing Filter. This proposal was approved and an installation made. After two years of use, the results are very satisfactory; the dirt problem is solved and another unit has been installed in the same plant.

The reason for the success of the FAR-AIR Self-Washing unit in this case (in addition to the extremely high efficiency of the FAR-AIR filters) was the fact that the unit could be set to *automatically* wash and re-oil itself just prior to the time that the furnaces were shaken down. Thus, maintenance was virtually eliminated and the filters were always at peak efficiency.

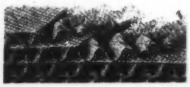
FAR-AIR Self-Washing Filters can be furnished to handle any CFM requirement. If you have an air filtration problem, Farr engineers will be glad to help you find the proper solution. There is a FAR-AIR product to meet most filtering needs. Write for complete information to Farr Company, P.O. Box 10187 Airport Station, Los Angeles 45, California.

Other FAR-AIR products include standard commercial and industrial panel filters, marine filters, rotary coolers, grease eliminators, filter maintenance equipment. Also, special filters for special applications.

*Name furnished on request.

**Trade Mark Registered

FAR-AIR FILTERS



FARR COMPANY "Better by Farr" *Manufacturing Engineers*

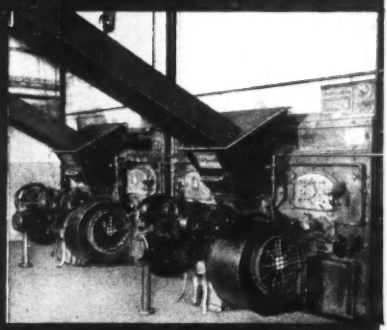
Los Angeles • Chicago • New York

Mf'd under license by Control Equipment Co., Ltd., Montreal, Canada.

Sun Valley, Idaho

DETROIT UNISTOKERS

SUN VALLEY



Sun Valley — the famous Idaho resort — selected four Detroit UniStokers for which two contracts have been placed since 1937. The UniStokers are equipped with Detroit Adjustable feed coal feed control. The coal is Wyoming Bituminous—12,000 BTU per pound.

UniStokers are sturdy, long lasting, single retort underfeed type in which fan and motor are conveniently mounted at the front.

Sun Valley reports recently: **"Excellent Service."**

Write for Bulletin

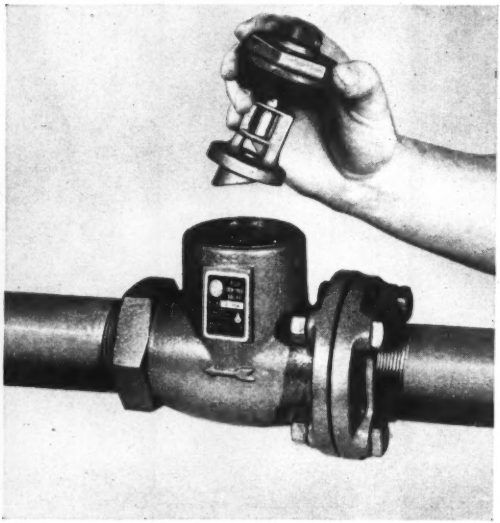
There is a type and size of Detroit Stoker for every industrial use

Detroit Stoker Company

General Motors Building • Detroit 2, Michigan
Works at Monroe, Mich. • District Offices in Principal Cities

ANGLE PATTERN

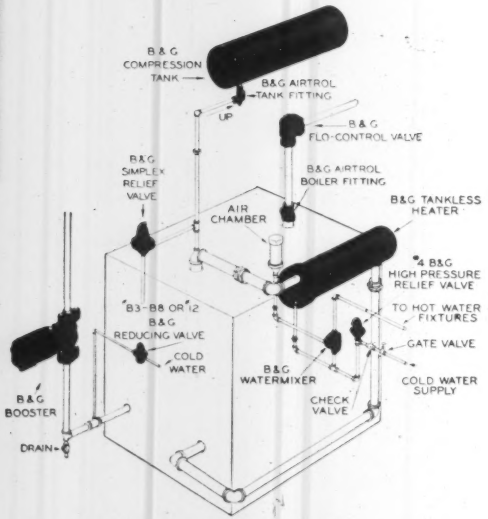
STRAIGHT PATTERN



Why it's better to buy

B&G FLO-CONTROL VALVES

. . . easily cleaned without breaking pipe connections



B & G HYDRO-FLO EQUIPMENT PROTECTS YOUR MOST VALUABLE ASSET—*CUSTOMER SATISFACTION!*

Everything you need for forced hot water heating systems and domestic water heating. Look for the B & G label—symbol of quality.

It's a tough job to clean a flow control valve if you have to take it out of the line. Avoid trouble—always install B & G Flo-Control Valves!

By simply unscrewing the top cap, the entire mechanism can be lifted out and the seat cleaned . . . all without breaking pipe connections. Could anything be quicker or easier?

B & G Flo-Control Valves are made in both angle and straight patterns, enabling you to meet any piping problem in the most convenient way. Both types can be quickly adjusted for either automatic operation or for gravity circulation.

The B & G Catalog gives complete size and capacity information—send for your copy.

Hydro-Flo PRODUCTS

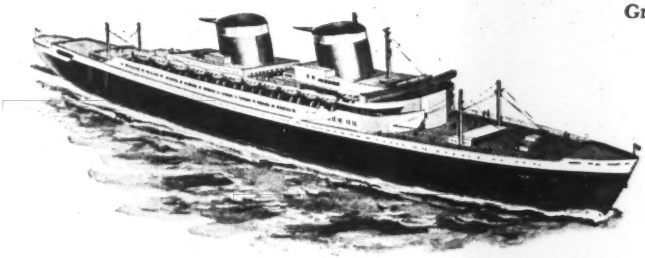
BELL & GOSSETT
COMPANY

Dept. CO-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

*Reg. U. S. Pat. Off.

ABOARD THE *SS United States*



Great new superliner S.S. United States, world's most modern passenger ship, largest, fastest ever built in this country. It introduces new standards in maritime engineering construction and decoration . . . the very cream of America's resources and skills.

YOU'LL FIND AN *Air of Luxury*

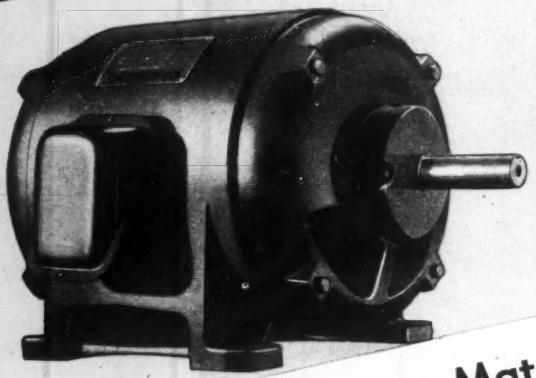
In hundreds of strategic locations on the seven decks of the S.S. United States, AGITAIR air diffusers provide 100% air distribution. They assure luxurious comfort in theatres, lounges, dining rooms, salons, shopping centers, swimming pools, sleeping quarters and every conceivable type of space. Rooms of varied sizes and shapes have draftless air distribution even though structural conditions throughout the ship determine and limit diffuser locations. The many problems posed by hundreds of different areas were successfully solved by pattern-made Type R AGITAIRS. Write today for latest technical data.

AIR DEVICES Inc.

17 East 42nd Street
New York 17, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

Simplify Your Drive



MOTORS

Standard open drip-proof, splash-proof, totally-enclosed, fan cooled and explosion proof. ½ hp and up, also wound rotor and dc. Special motors to meet your requirements.

Allis-Chalmers Matched Motors, Control and V-Belt Drives Save Design Time and Cut Installation Cost

DRIVE DESIGN IS EASIER AND QUICKER when you use Allis-Chalmers matched components on your fans and other air conditioning equipment. Coordinated design means ratings coincide, parts fit. You can provide variable speed electrically or through V-belts. Practically all your drive needs can be filled from one dependable source.

NATION-WIDE SERVICE

Over a hundred independent, factory-assisted Allis-Chalmers Certified Service Shops cover every industrial area in the country. Your customers can get prompt, efficient service for the Allis-Chalmers motors and drives on your equipment wherever they are.

ENGINEERING HELP

Allis-Chalmers engineers are familiar with air conditioning problems and may be able to offer you valuable suggestions for improving your designs and cutting costs. Call in the Allis-Chalmers representative early in your planning. No obligation, of course.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

A-3779

ALLIS-

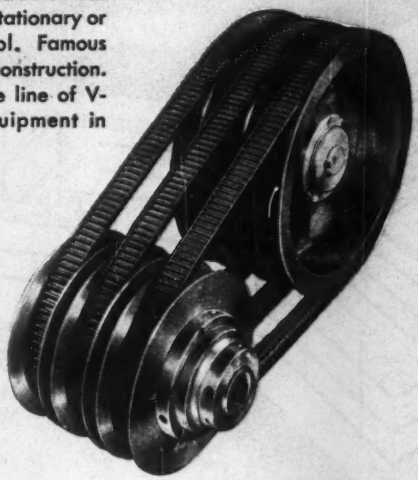
Design Problems!

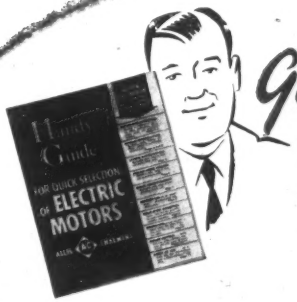
CONTROL

Complete matched control for any motor including manual and magnetic starters, push-buttons, variable speed control.

Texrope V-BELT DRIVES

Fixed speed and *Vari-Pitch* sheaves with stationary or motion control. Famous grommet belt construction. Most complete line of V-belt drive equipment in the industry.





Get the Help You Need!

Allis-Chalmers representatives in every industrial center are at your command. Just call the office nearest you.

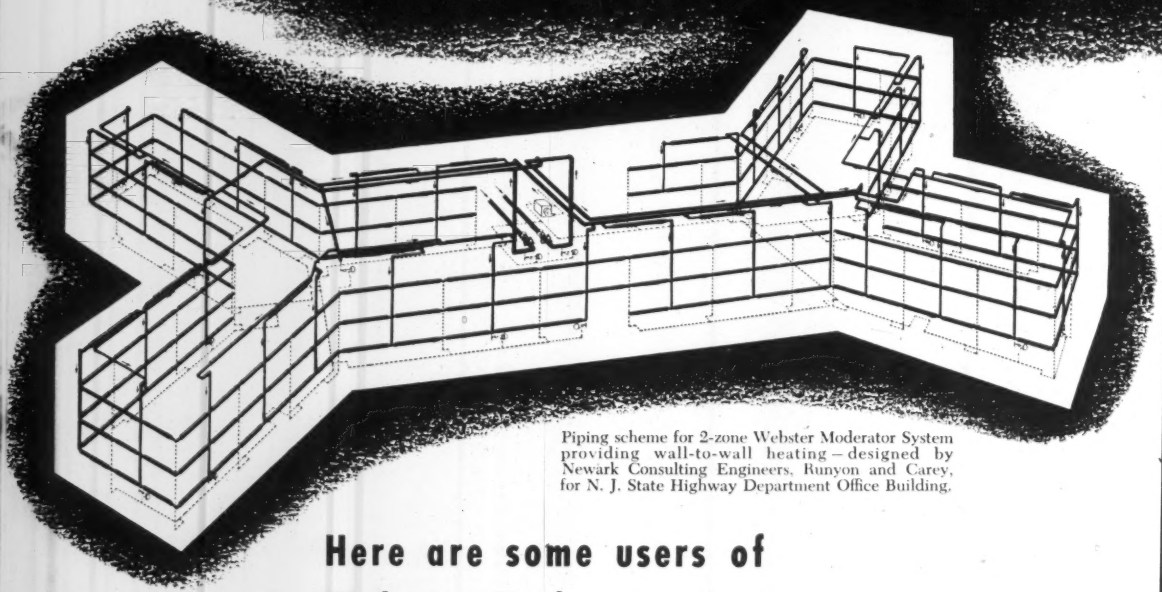
Write Allis-Chalmers, Milwaukee 1, Wisconsin for helpful literature.

Allis-Chalmers Motors and Control	51B6052
Texrope V-Belt Drives	20B6051

CHALMERS

A-C ALLIS-CHALMERS

fuel savings .



Piping scheme for 2-zone Webster Moderator System providing wall-to-wall heating – designed by Newark Consulting Engineers, Runyon and Carey, for N. J. State Highway Department Office Building.

Here are some users of Webster Moderator Systems

ARKANSAS
Crittenden County General Acute Hospital, West Memphis

CONNECTICUT
Aetna Fire Ins. Co., Hartford
Electric Light Co., Hartford
Fawcett Building, Greenwich
Hartford Hospital, Hartford
National Fire Ins. Co., Hartford
Phoenix Fire Ins. Co. Bldg., Hartford
Timothy Dwight Coll., Yale U., New Haven
Travelers Ins. Co., Hartford

DELAWARE
Delaware Hospital, Wilmington

DISTRICT OF COLUMBIA
Georgetown Univ. Hosp., Wash.

GEORGIA
Athens General Hospital, Athens
County Club Apts., Augusta
Emory University, Atlanta
Macon Hospital, Nurses' Home, Macon

ILLINOIS
Commonw. Edison Serv. Bldg., Chg.
Butler Brothers, Chicago
St. Francis Hospital, Kewanee
Sacred Heart Mission Sem., Geneva

INDIANA
Gibson Building, Indianapolis
Fletcher Trust Bldg., Indianapolis
Wm. H. Block Company Department Store, Indianapolis
Lincoln Bank Tower, Fort Wayne

IOWA
Equitable Life Building, Des Moines
Lexington Apts., Des Moines
Securities Building, Des Moines
Western Union College, Le Mars

LOUISIANA
Goodwood Elem. Sch., Baton Rouge
Louisiana State Univ., Baton Rouge
St. Agnes Elem. Sch., Baton Rouge
Wohl Apartments, New Orleans

MARYLAND
U.S. Printing and Lithographing Company, Baltimore
Lexington Building, Baltimore
Calvert Building, Baltimore
5th Regiment Armory, Baltimore
Hearst Tower Building, Baltimore

MASSACHUSETTS
75 Federal Street, Boston
Mt. Holyoke Coll., South Hadley
Monarch Life Ins. Co. Bldg., Springfield
Hotel Touraine, Boston

MICHIGAN
Wardell Sheraton Hotel, Detroit
C.I.O. Union Bldg. Corp., Detroit
Marygrove Coll., Immaculata Faculty Bldg., Detroit
Standard Accident Ins. Co., Detroit
Wolverine Hotel, Detroit
Central Michigan Community Hospital, Mount Pleasant

MINNESOTA
Rand Tower, Minneapolis
Health Center, Rochester
Zumbro Hotel & Colonial Hospital, Rochester
Medical & Surgical Bldg., Rochester
Minneapolis Athletic Club, Minneapolis
Great Northern Railway Co., St. Paul
Foshay Tower, Minneapolis
First Nat'l Bank Bldg., Rochester
Farmers & Mechanics Savings Bank, Minneapolis
Crosier Fathers Monastery, Onamia
Andrews Hotel, Minneapolis

A PLAN

you can heat it *better* (greater comfort, reduction of overheating and underheating) and at lower cost with a "Controlled-by-the-Weather" Webster Moderator System.

That's the conclusion of architects, engineers and contractors who have specified or installed the Webster Moderator System in thousands of steam-heated buildings since 1928.

Building owners and managers have fuel savings records to prove the soundness of the heating plans. For example:

An office building cut steam consumption $5,671 in three years . . . A new hospital used 18% less steam than the conservative engineering estimate . . . A group of 14 university buildings cut heating costs $9,500 in 12 months . . . An apartment building saved $567 in the first year.

A heating plan that includes a Webster Moderator System is simple, flexible and comfort-producing . . .

—*simple because there are just four control elements for each zone. The balancing of the system is done from the heating plan by the accurate sizing of Webster Metering Orifices in radiator supply valves.*

—*flexible because each system is "tailor-made" for the building in which it is installed. Each section of the building receives the desired amount of heat. Shut off a single room or an entire floor and the system automatically compensates for the decreased demand.*

—*comfort-producing because the Webster Outdoor Thermostat speeds up the delivery of heat when the outdoor temperature falls and slows down the delivery when the outdoor temperature rises.*

A group of five bulletins gives complete information on the Webster Moderator System. Write for your set today.

Address Dept. HP-7

WARREN WEBSTER & COMPANY

Camden 5, N.J. Representatives in Principal U.S. Cities : : *In Canada, Darling Bros., Limited, Montreal*

MISSISSIPPI
Mississippi State College
Marion County Hospital, Columbia
Jackson Co. Crt. Hse., Pascagoula

NEBRASKA
Insurance Building, Omaha

NEW HAMPSHIRE
Mary Hitchcock Hosp., Hanover
St. Anselm's College, Manchester

NEW JERSEY
Prudential Insurance Co., Newark
Mutual Ben. Life Ins. Co., Newark
Presbyterian Hospital, Newark
N. J. Mfrs. Assn. Bldg., Trenton

NEW YORK
Saks Fifth Avenue, N. Y. C.
Queensbury Hotel, Glens Falls
Corning Co. Bldg., Corning
Democrat & Chronicle Bldg., Rochester
Engineering Building, Rochester
Herald Building, Rochester
Municipal Airport Admin. Bldg., Rochester
Neisner Bros. Office Bldg., Rochester
Port Authority Bus Term., N. Y. C.
Skidmore Coll., Saratoga Springs
Eastern N. Y. Orthopedic Hosp., Schenectady
Genesee Building, Buffalo
Hearn Department Store, New York
Cooperative GLF Building, Ithaca
Card. Hayes Mem. High School, N.Y.C.

NORTH CAROLINA
E. Carolina Teachers' Coll., Greenville
Edenton Hospital, Wilson
Wake County Office Bldg., Raleigh
North Carolina State Coll., Raleigh

NORTH DAKOTA
Pioneer Mut. Life Ins. Co., Fargo

OHIO
Passenger Station, Big Four Railroad, Springfield
Hanna Building and Annex, Cleveland
Hotel Cleveland, Cleveland
Cleveland Pneum. Tool Co. Off. Bldg.

PENNSYLVANIA
Hess Bros. Dept. Store, Allentown
Pa. State Capitol Group, Harrisburg
Hotel Hershey, Hershey
Westinghouse Bldg., Phila.
Bellevue-Stratford Hotel, Phila.
Union Trust Building, Pittsburgh
Penn Mutual Life Ins. Co., Phila.
Masonic Temple, Pittsburgh

SOUTH CAROLINA
Clemson College, Clemson
S. C. Baptist Hospital, Columbia

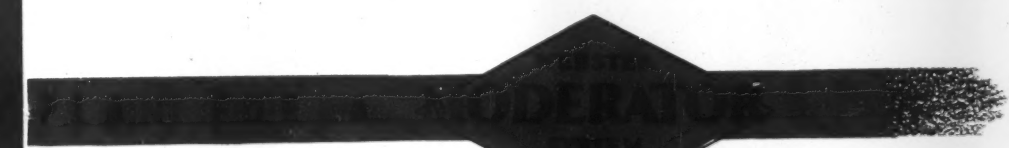
SOUTH DAKOTA
Huron Clinic, Huron

TENNESSEE
E. Tenn. Tuberc. Hosp., Knoxville
Eastern State Hospital, Knoxville
Hamilton Co. Mem. Hosp., Chattanooga
Holston Valley Community Hospital, Kingsport
Tenn. Copper Co., Off., Copper Hill

VERMONT
Barre City Hospital, Barre
Heaton Hospital, Montpelier

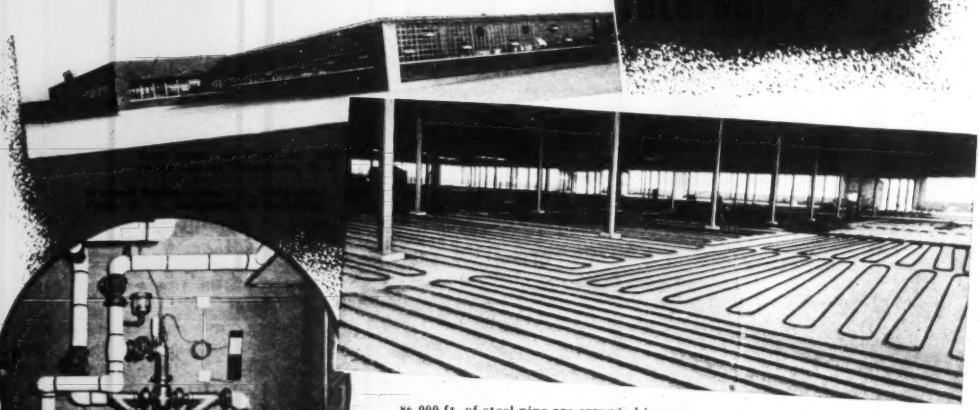
WEST VIRGINIA
Mineral Industries Bldg., of W. Va. Univ., Morgantown

WISCONSIN
Univ. of Wisc., Adams Hall, Madison
Lawrence College, Appleton
Schuster Stores, Milwaukee

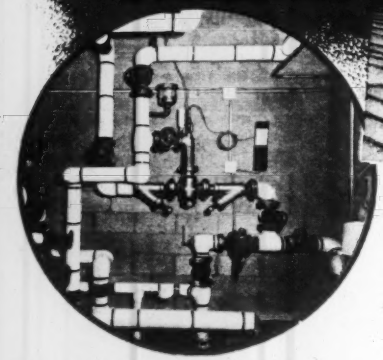


"Controlled [illegible]ne weather"

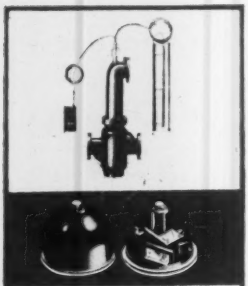
Sarcotherm
chosen for POTDEVIN MACHINE COMPANY'S LARGE PLANT



86,000 ft. of steel pipe are arranged in serpentine coils for the radiant heating system. Heating Contractor, Frank Lawton, Paterson, N. J



One of the 5 Sarcotherm Control valves, protected by strainers. A Sarcotherm Air Eliminator will be noted at the right.



The heart of the Sarcotherm control system is this unique control valve. It is actuated by liquid expansion thermostats, one located outside the building and one in the valve itself. Between them they anticipate changes in heat loss ratio, thus maintaining comfort temperatures under all conditions.

The Sarcotherm Comfort Control "Thermoray" is an extremely sensitive thermostat affected by both radiation and convection.

This latest addition to the industrial plants at Teterboro terminal covers an area of 102 thousand square feet.

The single story building is radiant heated by floor coils requiring 86,000 feet of pipe.

The system is divided into five zones, each controlled by a 3″ Sarcotherm Control Valve, type STA-1D, with Thermoray heat-loss thermostat for each zone.

Sarcotherm also furnished Sarcoflow balancing fittings, access boxes, strainers and other accessories.

This is the largest single story industrial building in the East, radiant heated by floor coils.

We are proud that

Sarcotherm Control

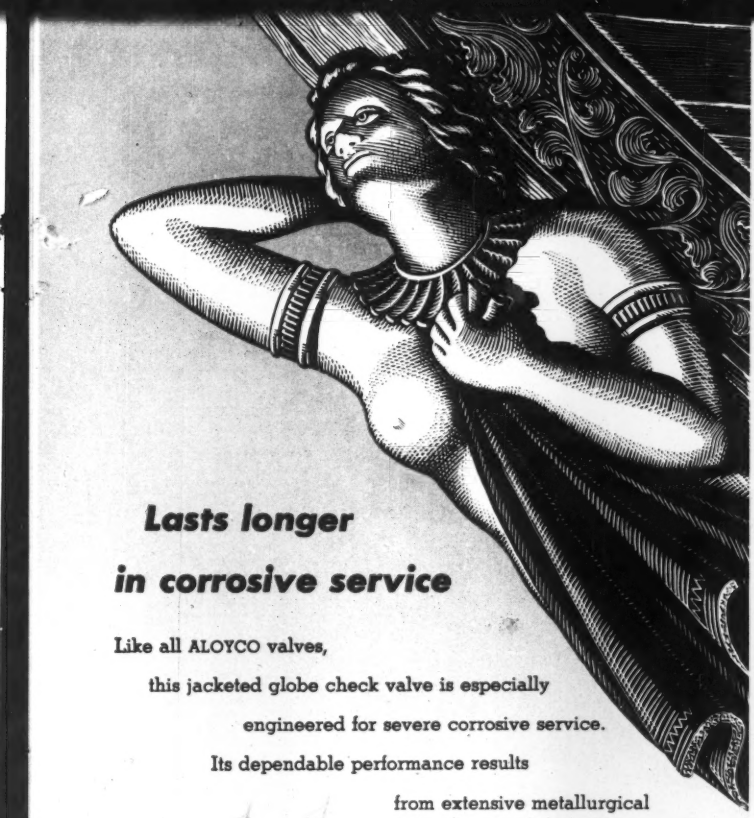
was selected for this outstanding job. Individually engineered Sarcotherm Control systems are available also for conventional forced Hot Water or Steam Heating Systems. Our Engineering Department will be glad to assist on your next job.

24

Sarcotherm CONTROLS, INC.

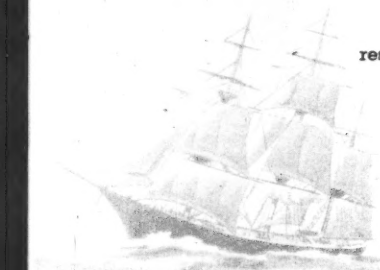
EMPIRE STATE BUILDING · NEW YORK 1, N. Y.

A SARCO PRODUCT

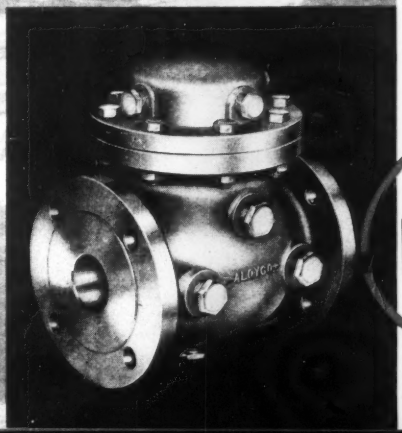


Lasts longer in corrosive service

Like all ALOYCO valves, this jacketed globe check valve is especially engineered for severe corrosive service. Its dependable performance results from extensive metallurgical research and production of high alloy valves exclusively.



ALOYCO No. 1505 Jacketed Check Valve has a cast-in heating chamber or jacket on both body and cap which enables all parts to be uniformly heated.



CALCO standardizes on ALOYCO valves for handling sulfuric acid

THE CORROSIVE: 93% and 98% sulfuric acid, 96% mixed sulfuric acid, oleum.

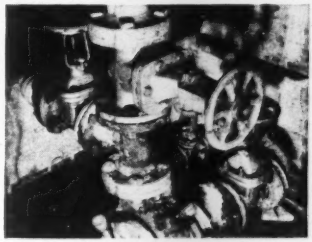
THE APPLICATION: Handling of sulfuric acid for manufacture from ilmenite ore of titanium dioxide, used as an additive to paints, rubber, paper, plastics.

THE PLACE: American Cyanamid Company, Calco Chemical Division, Gloucester City, N. J.

THE VALVES: ALOYCO 20 No. 111-A gate valves, flanged; No. 571 swing check valves, flanged; both Teflon packed.

THE RESULT: Former steel valves leaked at packing glands, causing corrosion of steel stem, stuck frequently in open or closed position. They lasted only a matter of months. Calco has now standardized on ALOYCO 20 valves for handling strong acid throughout the plant. Their service life is now five or six times as long as valves formerly used.

THE BACKGROUND: ALOYCO concentrates on valves for such severe corrosive service. Our foundry practices, our machines and our tools are designed for the production of high alloys alone.



ALOYCO 20 valves are used in three sulfuric acid handling areas: (1) Acid pumped from barges into main outside storage tanks; (2) Outside pump house pumps acid to smaller storage tanks inside main building; (3) Main inside pumps distribute acid to various reactors.

Our *Aloyco Department of Corrosion Analysis* specializes on problems of corrosion, contamination, discoloration, high and low temperature service.

If you have such problems in your plant, perhaps you too can profitably standardize on ALOYCO valves. Just ask ALOYCO.

ALLOY STEEL PRODUCTS CO., INC.
1322 West Elizabeth Avenue, Linden, N. J.

Longer Lasting
ALOYCO VALVES
1st in Corrosive Service

11 REASONS WHY—

YOUNG CONVECTORS ASSURE OWNER SATISFACTION

AIR SEAL
Strips of felt and or corner gaskets prevent air leaks and resultant wall streaking.

DAMPER CONTROL
Chain control regulates damper and rate of air flow thru cabinet and heating element.

OVER-SIZE GRILLE
Louvers direct air outward and permit abundant heat delivery . . . greater capacity.

MODERN CABINET
Finished in prime coat . . . can be painted to match decor . . . safe, rounded corners.

SIMPLIFIED PIPING
Cabinet knock-outs and header casting design permit piping from top and bottom.

EASY TO CLEAN
Remove screws to release one-piece front panel for seasonal cleaning.

SIMPLIFIED HEATING ELEMENT SUPPORTS
Provide quick installation and pitching adjustments. Hold heating element securely.

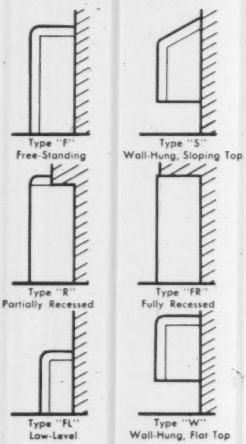
PACKAGED FOR PROTECTION
Reinforced, stapled cartons protect convectors. Marked for easy identification.

STANDARD RATINGS
The ratings of Young Convectors have been determined in conformance with Commercial Standard CS 140-47, as developed cooperatively by the trade and the National Bureau of Standards, U. S. Department of Commerce, and the said ratings have been approved by the Convector Rating Committee.

RADIANT HEAT
Heating element and adjacent surfaces help compensate for off-period heat loss.

HEATING ELEMENT
Sensitive non-ferrous tube-and-fin core is reinforced and protected by side plates.

SIX TYPES FOR EVERY INSTALLATION



Young Convector installations can be specified, installed and forgotten. Every care is taken in the engineering, rating and manufacturing of Young Convectors to produce heating elements that provide maximum heat transfer . . . to design cabinets that are attractive and can be painted to harmonize with room interiors. You'll appreciate the elimination of guesswork in Young approved ratings, the ease of installation, the protective packaging which simplifies handling and identification. The six standardized cabinet styles, shown at the left, are for use with any hot water or two-pipe steam system. See your nearest Young Representative, or write for Catalog Nos. 4049 and 4150.

1927 • 1952
25 YEARS OF PROGRESS IN HEAT TRANSFER ENGINEERING

YOUNG

Heating, Cooling, Air Conditioning Products for Home and Industry.

Heat Transfer Products for Automotive and Industrial Applications.

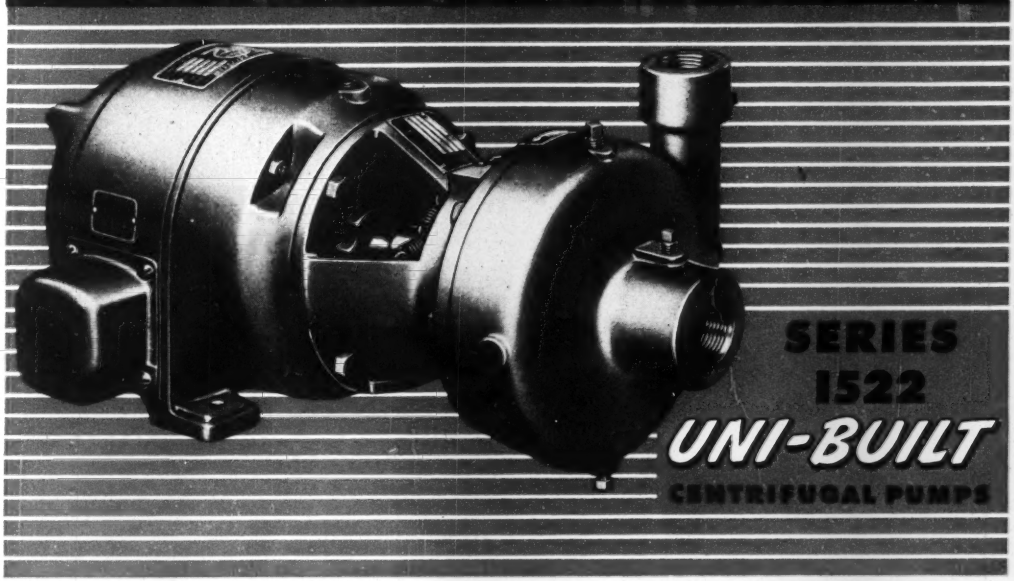
SEE OUR CATALOG IN SWEET'S

SEE our catalog in DOMESTIC ENGINEERING CATALOG DIRECTORY

YOUNG RADIATOR COMPANY
Dept. 512-G • RACINE, WISCONSIN
Factories at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Offices in all Principal Cities

NO WAITING . . .

Popular sizes carried in stock!



Designed especially for refrigeration and air conditioning applications

Complete capacity and dimensional data is given in this B & G Series 1522 Pump Catalog. Your copy will be sent upon request—together with selection sheet of popular sizes stocked at the factory for immediate delivery.

B & G manufactures a comprehensive line of *Hydro-Flo* Centrifugal Pumps, Condensers, Evaporators, Heat Exchangers and Liquid Receivers. Send for catalogs.

This is *the* pump for your cooling tower or evaporative condenser installations! For your convenience, a stock of most commonly used sizes is maintained at the factory—ready for immediate shipment.

The leak-proof Mechanical Seal alone makes the Series 1522 a "buy". It's self-lubricating and eliminates the usual leakage through the packing gland—assures long, trouble-free operation.

This pump is smooth-running . . . quiet!

Long bronze sleeve bearings hold the shaft in alignment and the spring-type flexible coupling helps keep noise at a minimum. Dynamic balancing of the impeller prevents shaft vibration and seal failure.

The bearing bracket sub-assembly, including shaft and sleeve bearings, is easily replaceable. Manufactured to close tolerances, this sub-assembly is interchangeable.

B & G Series 1522 Pumps are available in all-iron, bronze-fitted, all-bronze or stainless steel units.

With all these advantages, the 1522 is competitively priced!

Hydro-Flo®

REFRIGERATION EQUIPMENT

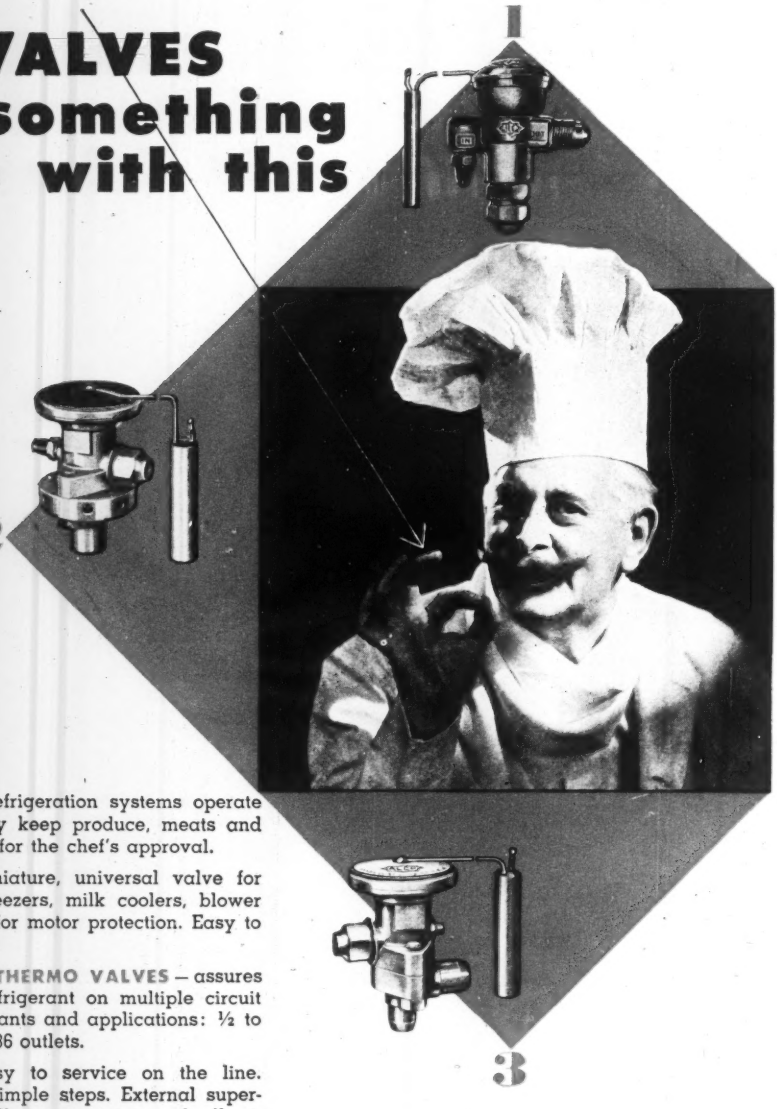
BELL & GOSSETT COMPANY

Dept. RCO-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto

®Reg. U. S. Pat. Off.

ALCO VALVES had something to do with this



ALCO VALVES help refrigeration systems operate at peak efficiency. They keep produce, meats and dairy foods "just right" for the chef's approval.

ALCO 402 TYPE — miniature, universal valve for display cases, deep freezers, milk coolers, blower coils. Pressure limiting for motor protection. Easy to install and service.

ALCO MULTI-OUTLET THERMO VALVES — assures equal distribution of refrigerant on multiple circuit systems. For all refrigerants and applications: ½ to 50 tons "Freon-12", 2 to 36 outlets.

ALCO "T" SERIES — easy to service on the line. Comes apart in three simple steps. External superheat adjustment. For all temperatures and all refrigerants: ½ to 50 tons "F-12".

ALCO SOLENOIDS — tight-seating; give accurate temperature control.

SEE YOUR ALCO WHOLESALER

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

S208

THE PICK OF THE PACKERS

Out where the West *ends* . . . many of the great meat packers use Worthington *refrigeration* machinery.

And all over the country, many famous *restaurants*—Toffenetti's in Times Square, Silver Fox Restaurant in Washington, The Century Room, Dallas—use Worthington *air conditioning machinery*.

When you specify "Worthington", you specify the air conditioning and refrigeration equipment that's used by the "first" names in every field.

No other manufacturer makes *so complete* a line. A Worthington system is all Worthington-*made*—not just Worthington-assembled—assuring you of perfectly balanced operation and unit responsibility.

Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

America's Leaders... in Many Businesses... Select

WORTHINGTON

A.2.11

AIR CONDITIONING AND REFRIGERATION

The Most Complete Line... Always the Correct Recommendation

Westinghouse-Sturtevant fans are used in this special Environmental Test Chamber that duplicates air conditions from sea level to 20 miles up for testing RCA electronic equipment.

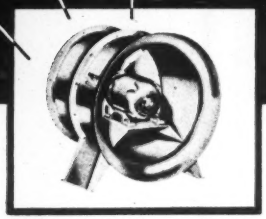
HOW DO ELECTRONIC DEVICES BEHAVE 70,000 FEET UP?

Lives depend on the answers found in this atmospheric testing chamber in type-test laboratories of RCA's Engineering Products Department. But the answers aren't easy to get. For the big problem is to duplicate as accurately as possible the thin, cold air of high altitudes.

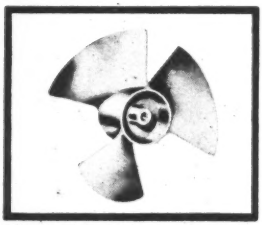
The solution? Powerful Westinghouse-Sturtevant Axiflo Fans constantly circulate chilled air, force temperatures down as low as –85°F. Working against a partial vacuum, created to simulate low pressures encountered in the upper regions of the stratosphere, these fans keep temperatures uniform to within several degrees by providing a homogeneous mixture of air throughout the chamber.

No matter how you want to *put air to work*—whether air handling, air conditioning or air cleaning—Westinghouse offers you a complete line of industry-proven equipment to fill your needs. For complete details, call your local Westinghouse-Sturtevant office. When you do, also ask for new General Catalog 600—a 60-page reference file for Putting Air To Work. Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

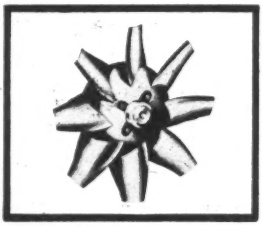
Test Chamber designed and installed by Tenney Engineering, Inc., Newark, N. J.



Axiflo Pressure Fans find wide use throughout industry because of adaptability to duct systems and for discharge against high winds.



3-Bladed Aluminum wheel is non-sparking, corrosion-resisting; handles large volumes.



8-Bladed Steel Wheel is non-overloading, quiet and stable; ideal for high temperatures.

YOU CAN BE SURE... IF IT'S Westinghouse

J-80267

AIR HANDLING

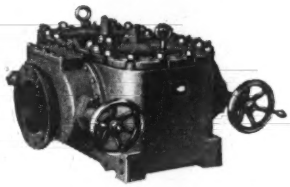
TUNE IN ON HISTORY! Only Westinghouse brings you complete coverage of four-month political campaign over CBS television and radio.

ZURN

OUR 50th ANNIVERSARY

STRAINERS IMMEASURABLY IMPROVE THE HANDLING OF FLUIDS (WATER, OIL, CHEMICALS) THROUGH PIPE LINES

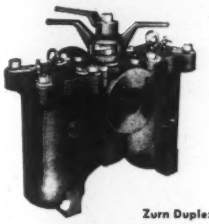
These Strainers Permit HIGH *Rates of Flow* With Remarkably LOW *Pressure Drop* From Input to Output



Zurn Duplex Multi-Basket Strainer.

Zurn Sinlex Strainer. Available in offset and straight-through types.

Zurn "Y" Type Strainers available in any cast material and for high pressures.



Zurn Duplex Plug Valve Strainer.

Write for Pipe Line Strainer Manual No. 951, including previously unpublished pressure drop data.

Zurn Strainer applications include Municipal Water Systems, Process Industries, Ships, Power Stations, Industrial Plants and High Temperature Installations. Zurn Engineers are available for consultation on all fluid handling problems.

J. A. ZURN MFG. CO.

INDUSTRIAL DIVISION • ERIE, PA., U. S. A.

In Canada: Canadian Zurn Engineering Ltd., Montreal, P. Q.

J. A. ZURN MFG. CO.

Industrial Division; Erie, Pa., U. S. A.

Please send me Pipe Line Strainer Manual No. 951

Name_____

Position_____

Company_____

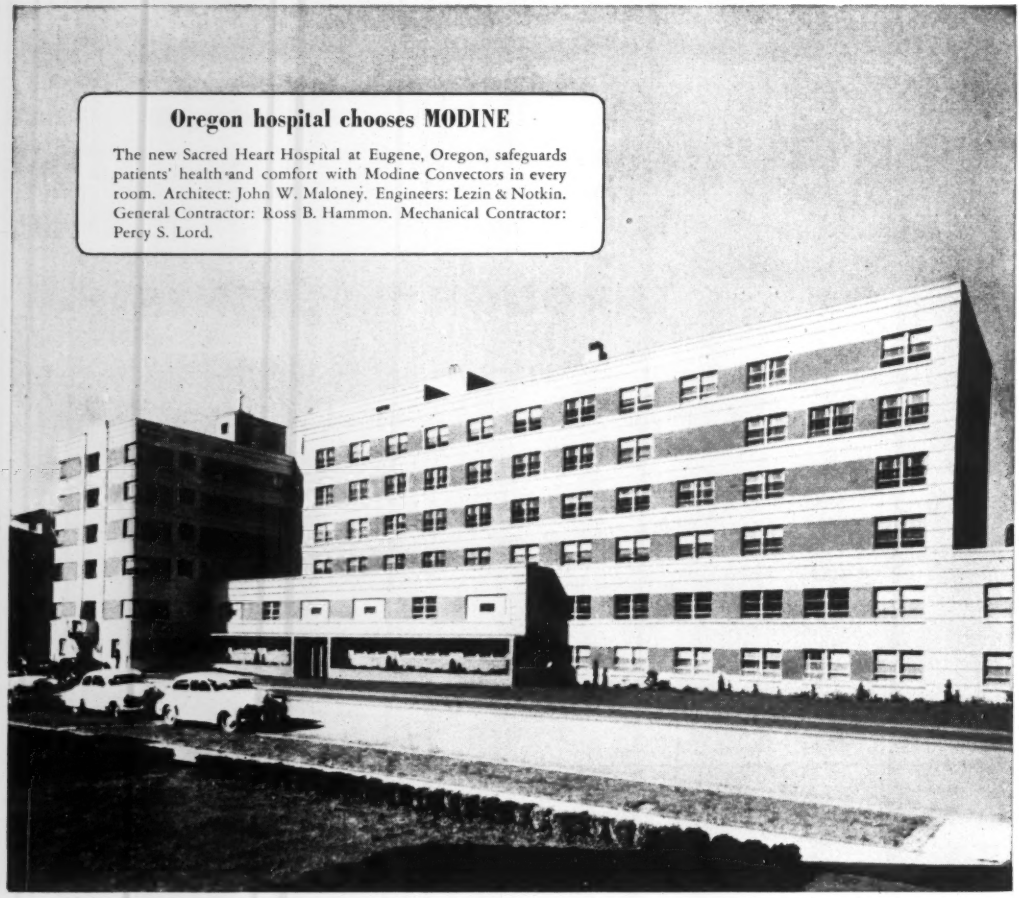
Street_____

City_____ State_____

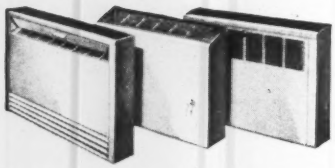
Please attach to your business letterhead—Dept. HP

Oregon hospital chooses MODINE

The new Sacred Heart Hospital at Eugene, Oregon, safeguards patients' health and comfort with Modine Convectors in every room. Architect: John W. Maloney. Engineers: Lezin & Notkin. General Contractor: Ross B. Hammon. Mechanical Contractor: Percy S. Lord.



America's finest buildings use America's finest convectors



Choose from three enclosure types in Standard and heavy-duty Institutional models for free-standing, recessed or wall-hung installation

WHEN top architects and heating engineers want the finest in modern heating, they specify Modine Convector Radiation. These beautfully styled convectors have met every test for uniform, healthful heating...for long-life, economical service. Ask your Modine representative for full information. He's listed in your telephone book classified section. Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

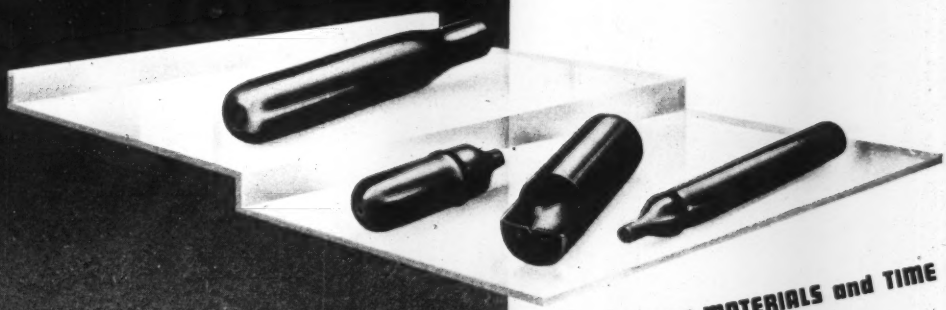
Modine CONVECTORS

R-1140

with FORMED ENDS

FOURTH OF A SERIES OF ADVERTISEMENTS THAT TELL ABOUT PRODUCTS THAT MEAN MUCH TO

HEATING, PIPING AND AIR CONDITIONING ENGINEERS



PRODUCED FASTER—GENERALLY REDUCE ASSEMBLY UNITS—CONSERVE MATERIALS and TIME

If you require a component that is tubular with ends specially shaped, consider the advantages of producing it from a length of Wolverine nonferrous tube formed by our exclusive Spun End Process.* This process can be used to produce a wide variety of end forms—round, tapered, or related forms, partially or completely closed.

In most cases, this process can bring you economies of time and material, for a slight change in design can affect reduction of parts required. This saves assembly time as well as the cost of the parts that now can be discarded.

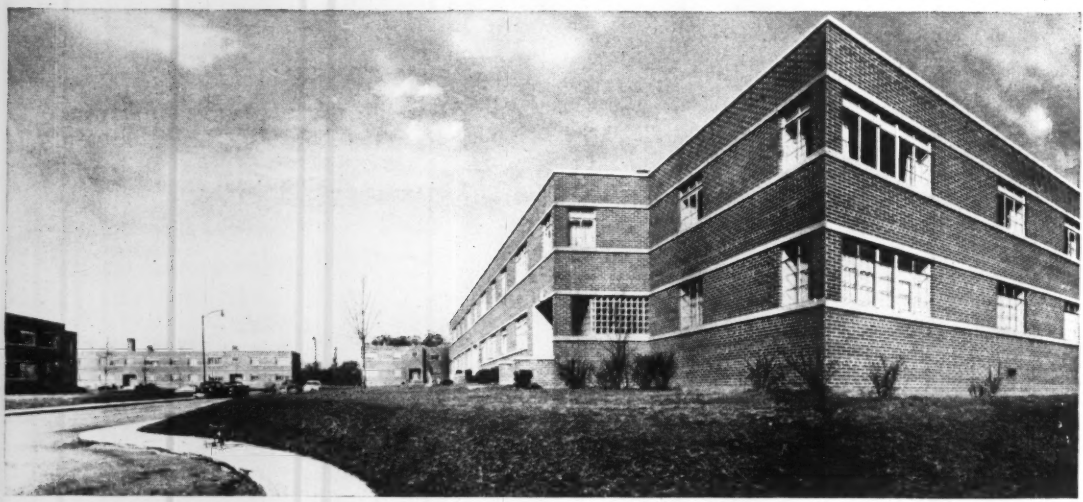
To help you better visualize the many ramifications of this unique process, send for a copy of our new brochure, "Spun End Tube". Its pages may open your eyes to the new possibilities this "different" form of production affords.

*A patented process Re: 22465

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, nonferrous tubing
1419 Central Ave. • Detroit 9, Mich.

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Company, London, Ontario.

Wolverine Mill Depots:
DETROIT, MICH. • DECATUR, ALA. • HOUSTON, TEXAS • LOS ANGELES, CALIF.
LONG ISLAND CITY, N. Y. • PHILADELPHIA, PA. • PROVIDENCE, R. I. • ST. LOUIS, MO.



Why Honeywell Customized Temperature Control is a wise investment for apartment owners

Increased "rentability" will be an important factor in the years ahead

Lots of sun, fresh air, room for children to play—these all appeal to tenants at Meadowbrook Apartments, a garden apartment development in Indianapolis, Indiana.

And so does Honeywell Customized Temperature Control that gives each tenant *individual temperature control*, an advantage unfortunately not enjoyed by many apartment dwellers.

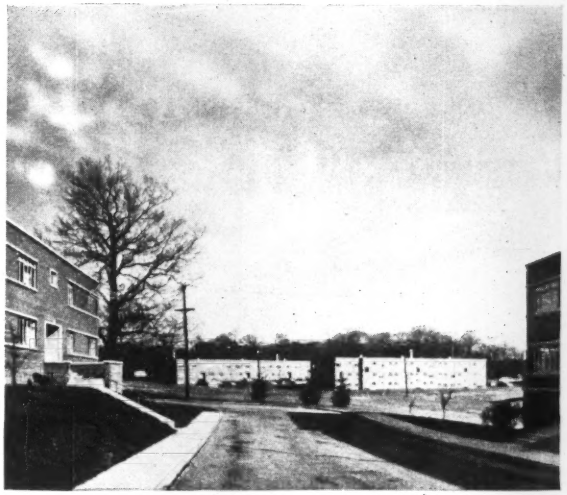
For at Meadowbrook there's a thermostat in each and every apartment.

When you talk to tenants about the heating system and the individual temperature control they enjoy, they agree both are the best they've ever known, that they're equal to what you find in the finest private homes.

And the resident manager of Meadowbrook, Henry C. Dickson, feels that Honeywell Customized Temperature Control definitely helped increase "rentability" at the time the buildings were finished.

What's more, he feels Honeywell Customized Temperature Control will give him a definite competitive advantage, tenant-wise, for years to come.

The Honeywell Thermostat in the typical apartment at right is located on the wall between the living and dining areas. Individual thermostats give each tenant *his own* temperature control as he wants it and when he wants it. Result: comfortable tenants. And comfortable tenants are satisfied tenants.



For Comfortable, Even Temperature in New or Existing Buildings—of Any Size, Specify Honeywell Customized Temperature Control

Whether it's an apartment, office, store, factory, school, garage—or any size building—new or existing Honeywell Customized Temperature Control can help meet your clients' heating and ventilating problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal "climate"—and save fuel besides.

For full facts call your local Honeywell office. There are 91 across the nation. Or mail the coupon today.

Architect J. Lloyd Allen, above, of Allen and Kelley, Indianapolis, looks on as designer R. K. Zimmerly describes how Honeywell Customized Temperature Control helped solve a knotty exposure problem. The model shows clearly the varied exposures of Meadowbrook's 37 buildings, its 647 one- and two-bedroom apartments that are located on the 50-acre tract.

Meadowbrook was designed to give families all the convenience and comfort of apartment life, yet retain many advantages normally available only in private homes.

"It's no trouble at all when it comes to maintenance," says William D. Gill, Meadowbrook's superintendent of buildings and property.

"Tenants are happy with Honeywell Customized Temperature Control because it gives them individual comfort. But for my money it's ideal because it requires very little maintenance."

MINNEAPOLIS

Honeywell

First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HA-7-168, Minneapolis 8, Minnesota

Gentlemen:

I'm interested in learning more about Honeywell Customized Temperature Control.

Name _____

Firm Name _____

Address _____

City _____ *Zone* ____ *State* _____

WeldELLS®

...have set their own standards

Many of the largest users of Welding fittings refuse to accept any other fittings than WeldELLS.

They have found that when the name, WeldELL, is stamped into a fitting, that fitting can be accepted without question for any service for which it is designed.

They have found that WeldELLS have features that please both the men who design and the men who erect welded piping . . . features that were pioneered by Taylor Forge . . . features that are combined in no other welding fittings.

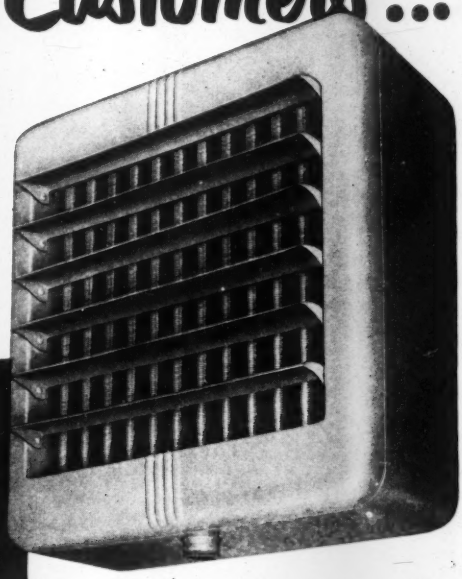
They have found the answer to their every need in the greater range of sizes, weights and types of the WeldELL line . . . in the broader scope of materials.

For up-to-the-minute facts
see your Taylor Forge Distributor

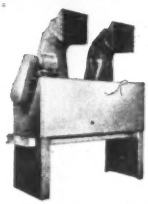
TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill.
Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Remind Your Customers ...



ACTION NOW WILL SAVE HEATING HEADACHES LATER!



Blower Type UNIT HEATERS

For effective heat distribution over large open areas. Available in 8 sizes . . . in suspended and floor models, with one and two row coils; capacities from 23,800 to 1,659,000 Btu per hour.

Down Flow UNIT HEATERS

This McQuay "vertical" unit heater, suspended near the ceiling, utilizes the warm air in that area and distributes it down to the floor level. No wasted heat, no cold spots. Four types of draftless diffusers available.

This is the time to remind customers that installing McQuay Horizontal Unit Heaters *now*, will save them the grief of another season of struggling along with the old system.

McQuay Horizontal Unit Heaters are made in a wide range of capacities, from 20,300 to 360,000 Btu per hour. Every unit has the exclusive Ripple Fin Coil construction . . . with these advantages: more heat transfer surface, greater flexible strength, cleaner operation... flexible copper tube headers to accommodate unequal expansion and contraction. Tubes expanded into fins having wide, smooth collars, without use of any low conductivity bonding agents, provide a permanent mechanical bond.

These advantages, plus modern cabinet styling, quiet motor fan assembly and Test Code Ratings are your guarantee of satisfied customers—especially if you convince them the time to get the job done is now—before, not after, the heat is needed. Write for catalog. Representatives in principal cities. McQuay Inc., 1601 Broadway St. N.E., Minneapolis 13, Minnesota.

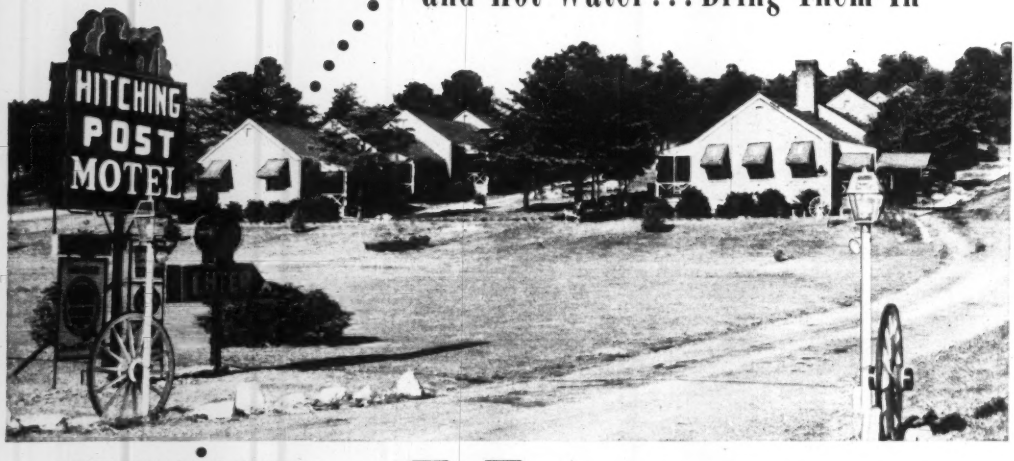
McQuay INC.

HEATING • AIR CONDITIONING REFRIGERATION

N E S W

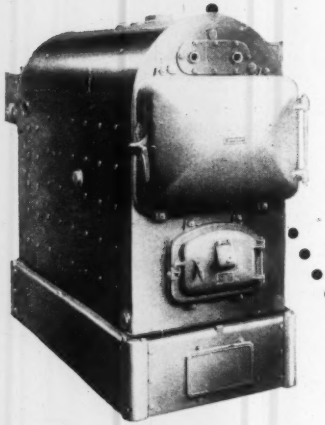
MAKE THE SEASONS COME TO YOU

Modern Steel Boiler Heat and Hot Water... Bring Them In



HITCHING POST MOTEL
Roanoke, Va.

E. PAUL HAYES & ASSOCIATES
• Architects



Kewanee Square Heat Boiler
installed by
WEDDLE PLUMBING
and HEATING COMPANY

KEWANEE

STEEL BOILERS

With guests coming and leaving at all hours of the day and night, Modern Motels must provide comfortable heat and have an abundance of hot water for showering and shaving *24 hours a day.*

One pays for a boiler only once, but its fuel must be bought every year . . . and fuel is one of the important expense items in the operation of any building.

Because of their ability to produce *more heat with less fuel*... plus a durability that means extra years of service... Kewanee is the ever increasing choice for our finest modern Motels.

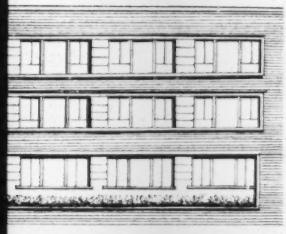
KEWANEE-ROSS CORPORATION
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION
KEWANEE, ILLINOIS

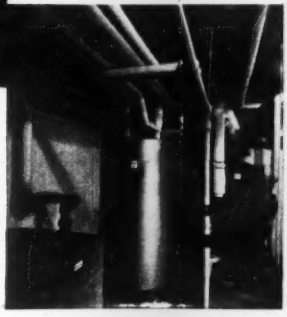
KEWANEE BOILERS

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

on PEACHTREE street:





on SPANG® CW

In winter, as well as in summer, Atlanta's Red Cross blood bank *must* keep functioning. So Red Cross Officials selected materials for the heating system of their new headquarters building with extra-care—and placed their faith in reliable Spang CW for piping needs.

Wherever you go—North or South—you'll find architects, owners and contractors who insist on reliability insist on Spang Steel Pipe. Which is natural, for Spang Pipe is *quality-controlled* from raw material to final shipment. Thus it's always uniform in every way—always certain to give complete dependability and freedom from trouble.

What's more, it's easy to bend, easy to cut, easy to thread—all factors that pay off in longer tool life and faster installation.

So never take pipe that's "just as good"—insist on quality-controlled Spang Steel Pipe. You can't *see* this difference, but it's there. Your Spang Distributor can show you what we mean.

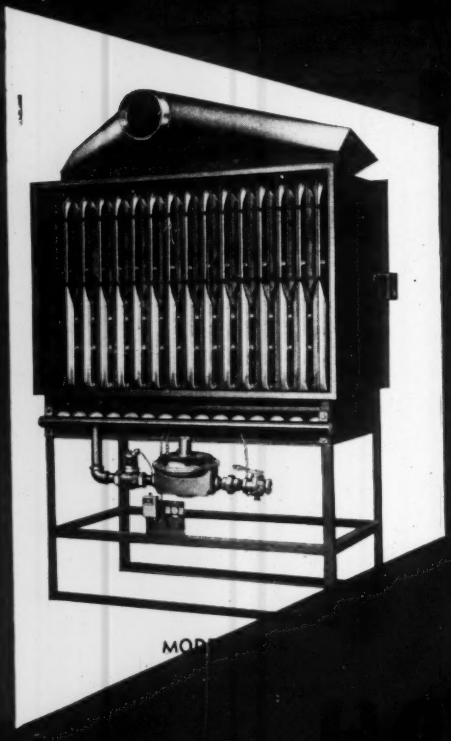
OWNER: AMERICAN RED CROSS, ATLANTA, GA.
ARCHITECTS: BODIN & LAMBERSON, ATLANTA, GA.
GENERAL CONTRACTOR: BARGE THOMPSON COMPANY, ATLANTA, GA.
PIPING CONTRACTOR: SOCKWELL CO., ATLANTA, GA.
PIPE: SPANG STANDARD CW BLACK IN SIZES FROM ½" TO 3"

SPANG

SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Pittsburgh 30, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis



Your GILT-EDGED SALES Opportunity

New—5-YEAR WARRANTY

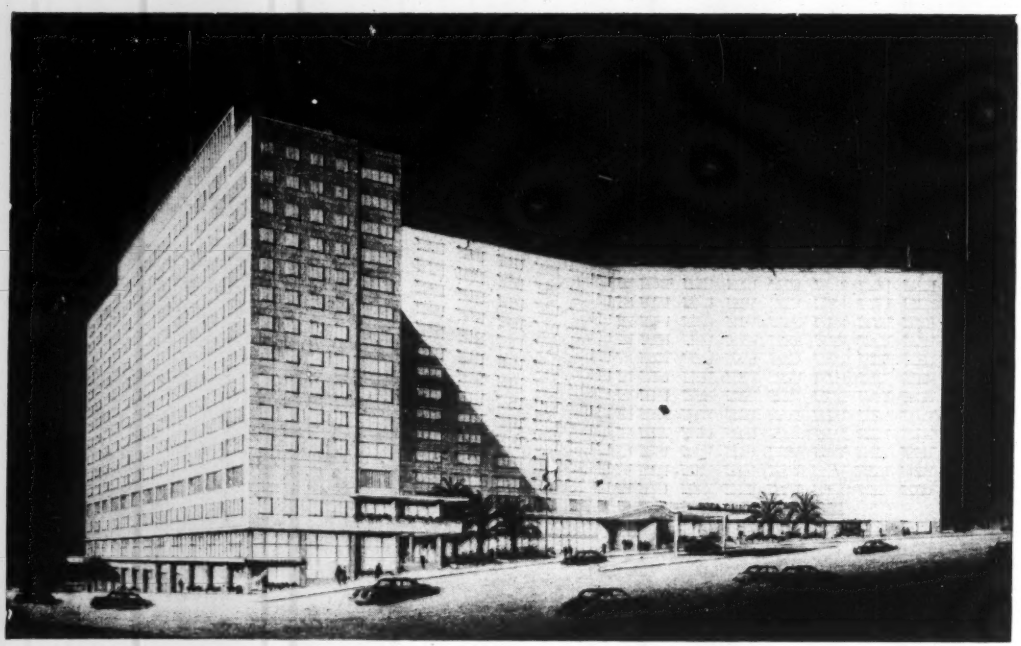
For ALL Curtis Packaged Air Conditioners

Now, every Curtis Packaged Air Conditioning unit sold through franchised distributors is covered by a new, 5-year factory warranty. This includes 2, 3, 5, 7½, 10 and 15-H.P. sizes. Find out more about your profit possibilities with Curtis. Use the coupon

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1950 Kienlen Avenue • St. Louis 20, Missouri

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1950 Kienlen Avenue, St. Louis 20, Missouri
I am interested in direct factory franchise. Send complete details.

Company Name .....
Street .....
City ..... Zone ..... State .....
Signed .....



Architects and Engineers: Holabird & Root & Burgee, Chicago, Ill.
Associate Architect: William B. Tabler

New heights in comfort and convenience for the biggest hotel built in twenty years

THE NEW STATLER HOTEL now nearing completion in Los Angeles, represents the ultimate both in its appointments and construction. Comfort, convenience and efficiency are stressed throughout. Every room is air conditioned. There's an off-street concourse for motorist-guests who are checked in and whisked to their rooms without even going through the lobby. Dimmers on the ballroom lights, under-water lighting for the swimming pool, music in the passenger elevators are luxurious innovations typical of this truly modern hostelry.

And, though guests are unaware of it, their safety and comfort are further insured by NATIONAL Steel Pipe—325 tons of it—used in the heating, fire-sprinkler and dry fire systems, as well as for vacuum lines.

Here, as in other famous hotels, apartment houses, schools, hospitals, office and public buildings, NATIONAL Steel Pipe was selected because of its consistently high record of service dependability.

U·S·S NATIONAL has been the standard pipe for over 60 years for conventional hot water and steam heating systems; for fire control and plumbing lines, and the first choice for modern radiant heating and snow melting applications described in Bulletin No. 19—Radiant Heating With National Pipe. Copy upon request.

NATIONAL TUBE DIVISION

UNITED STATES STEEL COMPANY, PITTSBURGH, PA.

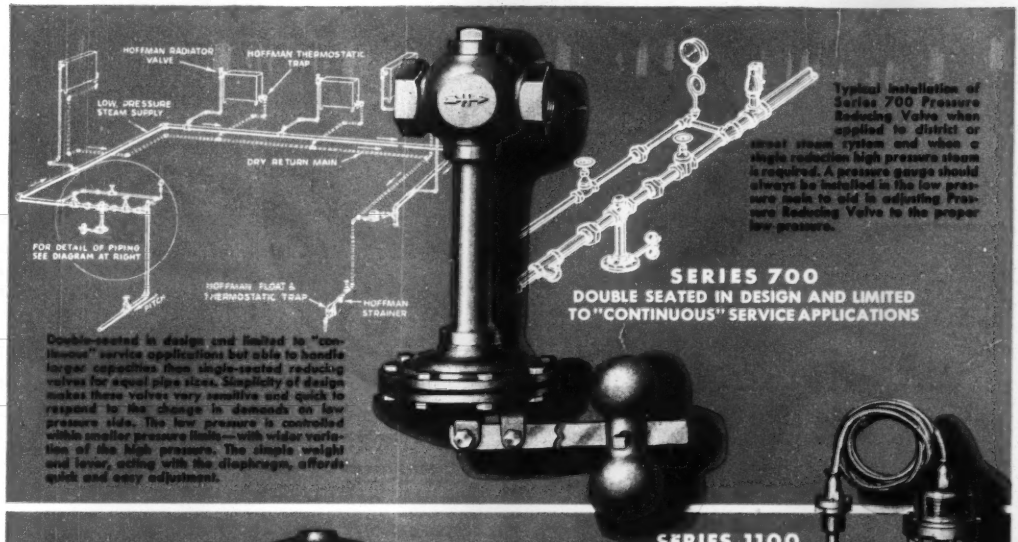
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

HOFFMAN COMPLETE LINE

OF *PRESSURE REDUCING VALVES*

FOR STEAM • WATER • AIR • FUEL OIL • GASOLINE


HOFFMAN RADIATOR VALVE
HOFFMAN THERMOSTATIC TRAP
LOW PRESSURE STEAM SUPPLY
DRY RETURN MAIN
FOR DETAIL OF PIPING SEE DIAGRAM AT RIGHT
HOFFMAN FLOAT & THERMOSTATIC TRAP
HOFFMAN STRAINER

Typical installation of Series 700 Pressure Reducing Valve when applied to district or street steam system and when a single reduction high pressure steam is required. A pressure gauge should always be installed in the low pressure main to aid in adjusting Pressure Reducing Valve to the proper low pressure.

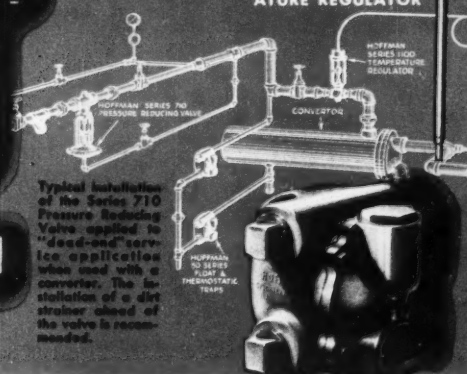
SERIES 700
DOUBLE SEATED IN DESIGN AND LIMITED TO "CONTINUOUS" SERVICE APPLICATIONS

Double-seated in design and limited to "continuous" service applications but able to handle larger capacities than single-seated reducing valves for equal pipe sizes. Simplicity of design makes these valves very sensitive and quick to respond to the change in demands on low pressure side. The low pressure is controlled within smaller pressure limits—with wider variation of the high pressure. The simple weight and lever, acting with the diaphragm, affords quick and easy adjustment.

SERIES 1100
HOFFMAN TEMPERATURE REGULATOR

SERIES 710, 715, 720 and 750
SINGLE SEATED FOR EITHER "DEAD END" OR "CONTINUOUS" SERVICE

Can be installed with the diaphragm case either above or below the main. Will reduce steam, hot or cold water, fuel oil, and gasoline. Typical applications include supplying reduced pressure to hot water heaters equipped with regulators, steam irons, pressing machines, tire and rubber vulcanizing equipment, sterilizing apparatus, laundry equipment and for use as a pump governor for small steam pumps.


HOFFMAN SERIES 1100 TEMPERATURE REGULATOR
HOFFMAN SERIES 710 PRESSURE REDUCING VALVE
CONVERTOR
HOFFMAN 50 SERIES FLOAT & THERMOSTATIC TRAPS

Typical installation of the Series 710 Pressure Reducing Valve applied to "dead-end" service application when used with a converter. The installation of a dirt strainer ahead of the valve is recommended.

50 SERIES

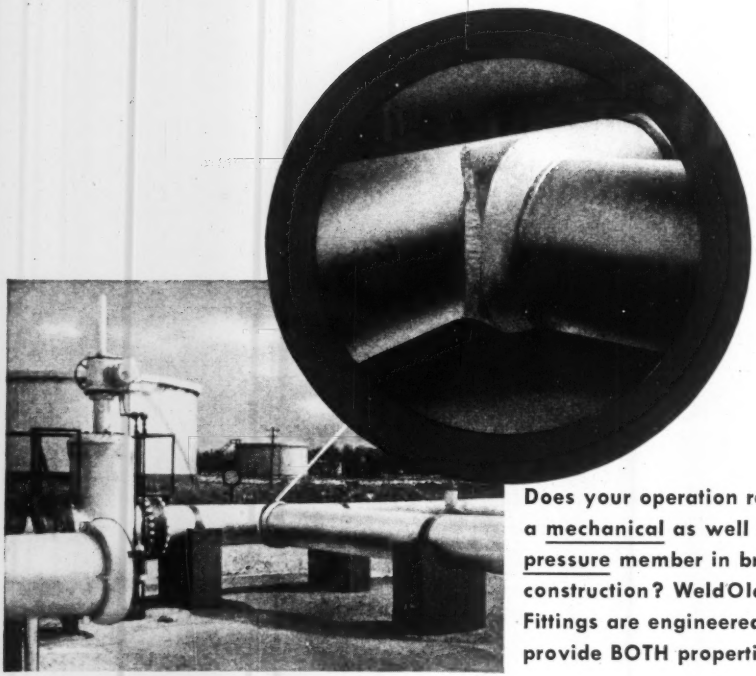
SERIES	SIZES	TYPE	SERVICE APPLICATIONS
700	½" to 8"	Weight and Lever	Double seated for continuous service only
710	½" to 1½"	Spring loaded diaphragm	Single seated for continuous service or dead-end service
715	2" to 4"	Spring loaded diaphragm	Single seated for continuous service or dead-end service
720	¾" to 6"	Weight and Lever or Spring loaded diaphragm	Single seated, balanced for continuous service or dead-end service
750	½", ¾", 1"	Self-contained spring loaded diaphragm	Single seated, small capacity, for continuous service or dead-end service

Hoffman Pressure Reducing Valves offer design features appreciated by the maintenance man in saving man-hours, and maintaining efficient plant operation. Sold by leading wholesalers of Heating and Plumbing Equipment. Write factory for illustrated bulletins, no obligation.

HOFFMAN SPECIALTY MFG. CORP., 1001 York St., Indianapolis 7, Ind.

ENGINEERED REINFORCEMENT

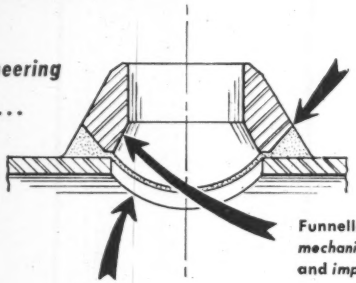
FOR YOUR BRANCH CONNECTIONS



Does your operation require a mechanical as well as a pressure member in branch construction? WeldOlet Welding Fittings are engineered to provide BOTH properties.

A big portion of your engineering job is done for you, if you...

Specify Bonney WeldOlet Welding Fittings to Insure Permanent Strength



Reinforcement where both the mechanical and internal *stresses are most severe*

Funnelled to relieve *mechanical stress concentrations* and *improve fluid flow*

Shaped and beveled for *clean, quick and economical installation*

FOR COMPLETE ENGINEERING DATA WRITE FOR YOUR BONNEY W3 WELDOLET CATALOG

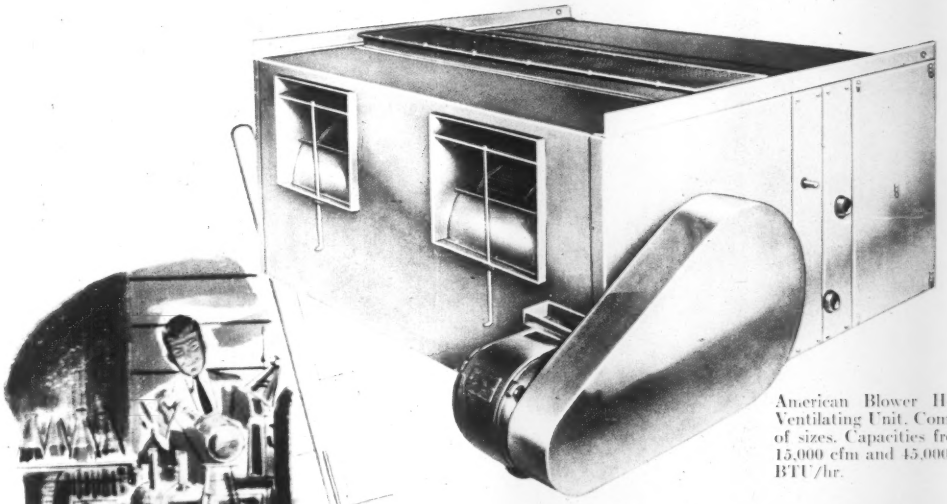
WELDING FITTINGS DIVISION

BONNEY FORGE & TOOL WORKS

ENG. DEPT., 715 MEADOW STREET

ALLENTOWN, PENNSYLVANIA

American Blower – a time-honored name in air handling



American Blower Heating and Ventilating Unit. Complete range of sizes. Capacities from 1000 to 15,000 cfm and 45,000 to 976,000 BTU/hr.

That delightfully fresh, pleasant atmosphere which works wonders for employee morale, working and selling conditions, is assured when American Blower Heating and Ventilating Units are installed.

These dependable units, with slow-speed centrifugal fans, are available in a wide range of sizes for wall, horizontal, inverted and floor installation. Each fan housing is equipped with Aileron control. Humidifiers, face and by-pass dampers, filter boxes and mixing boxes are available.

Investigate these efficient Heating and Ventilating Units *now*. Call your nearest American Blower Branch Office for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

"It's foolish to try to be bigger than you are"

REMEMBER Aesop's fable of the frog and the ox? Told 2,500 years ago, it goes:

"Three young frogs cried to their mother that a little brother had been trampled by the largest beast in the swamp. 'Oh, no,' said the mother, 'no beast is larger than I.' And she blew herself up to show how big she really was. 'But it was much bigger,' the little ones chorused. Whereupon the vain mother inflated herself until she burst." And the moral was, "It's foolish to try to be bigger than you are."

Aside from the wisdom of the fable for each of us individually, there is solemn warning for us as a nation. Some among us seem to believe that with an unlimited supply of taxpayers' dollars America can buy anything--ease and security at home, acceptance of our ideas abroad, friendship of other peoples, even world peace.

Like the vain frog, America inflates herself more and more dangerously, trying to stretch herself to be the biggest thing in the swamp. Meanwhile the enormous beast that is the world goes its own way, scarcely affected by the vainglorious display of America's inflation. It's the same old world that was indifferent before the pomp of Egypt, Persia, Greece and Rome.

How will our present "puffing" end? Isn't it obvious that continued inflation can bring disaster? Only by a realistic policy of living within our means--not trying to be bigger than we are--can America avoid the catastrophe of Aesop's foolish frog.

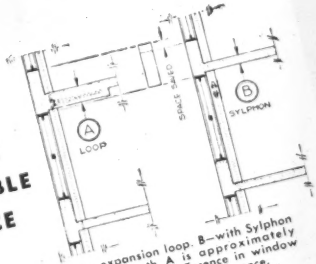
YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

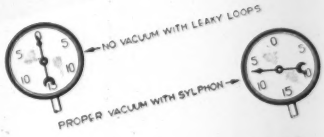
General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

MORE RENTABLE SPACE

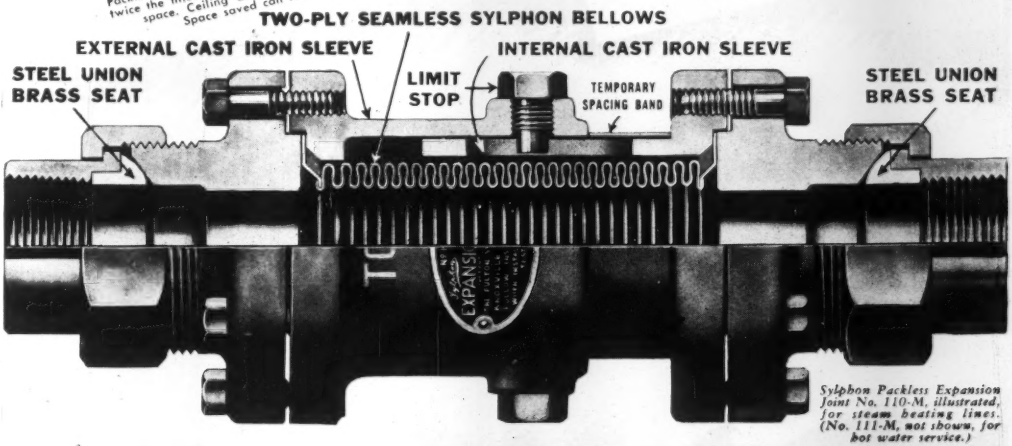


A—construction with ordinary expansion loop. B—with Sylphon Packless Expansion Joint. Floor depth A is approximately twice the thickness of B. Corresponding difference in window space. Ceiling at B unbroken, better appearance. Space saved can mean an extra story.



LOWER HEATING COSTS

Sylphon Packless Expansion Joints assure continuous, sealed steam piping system, free from leaks. By virtue of actually holding high vacuum on returns, they make it possible to operate heating system with very low pressure-reducing steam consumption.



Sylphon Packless Expansion Joint No. 110-M, illustrated, for steam heating lines. (No. 111-M, not shown, for hot water service.)

BUILD SAVINGS INTO BUILDINGS!

...with Sylphon Packless Expansion Joints

Sylphon Packless Expansion Joints help builders and building owners make important savings. Used in place of expansion loops, these Joints eliminate useless building height—make possible more revenue producing space. They help simplify building plans—save construction materials and costs.

Then, by assuring a continuous, sealed piping system, they eliminate wasteful leaks and costly repacking of ordinary expansion members. Steam or hot water is distributed with greatest economy of space—and a sizeable reduction in heating costs.

Sylphon Packless Expansion Joints are simple—compact—have few component parts. Completely assembled, easily installed. Thousands in use. For information, write for Catalog NH-65.

FS

FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO. KNOXVILLE 4, TENN.

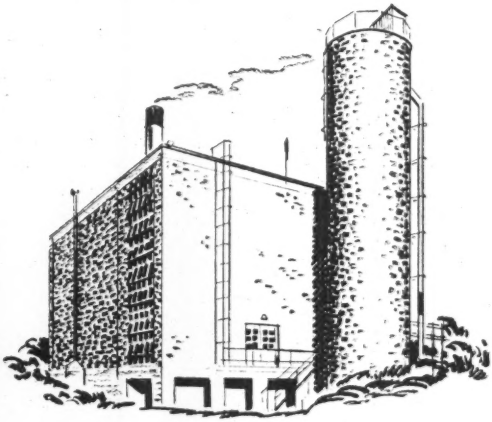
Canadian Representatives, Darling Brothers, Montreal

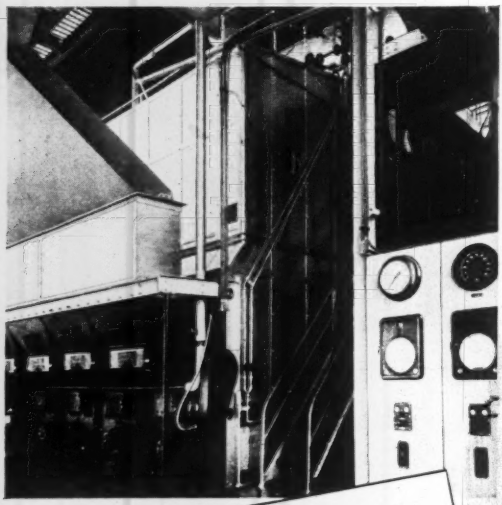
"HOW WE SAVE MORE THAN $90,000 A YEAR—

BY BURNING COAL THE MODERN WAY!"

says W. H. FISHER, Plant Engineer, Kerr Bleaching and Finishing Works, Concord, North Carolina.

"Powering our plant used to take nine boilers—now *one* does the same job *using 30% less fuel!* 6 firemen now do the work of 18—thanks to modern coal-handling equipment and automatic controls. That's why we say, you can't beat bituminous coal burned with modern equipment."





Above is a view of the plant's modern, space-saving coal-storage silo. To the left is a close-up of the firing aisle, showing the spreader stoker and the main control panel. Coal handling is automatic and dust-tight throughout. Automatic controls regulate firing, drafts and feed-water—give maximum efficiency at lowest cost.

If you operate your own steam plant, you can't afford to ignore these few down-to-earth facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U. S. A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

Burning coal the modern way can save *you* money, too! First, labor costs can be cut to a minimum with up-to-date coal- and ash-handling equipment. On top of that, today's combustion installations give you 10 to 40% more power from each ton of coal than was possible a few years ago!

If you're planning to modernize, or if you're building a new plant, call in a consulting engineer. He'll show you how you can get big savings by burning coal in a modern plant designed to meet your *specific* needs.

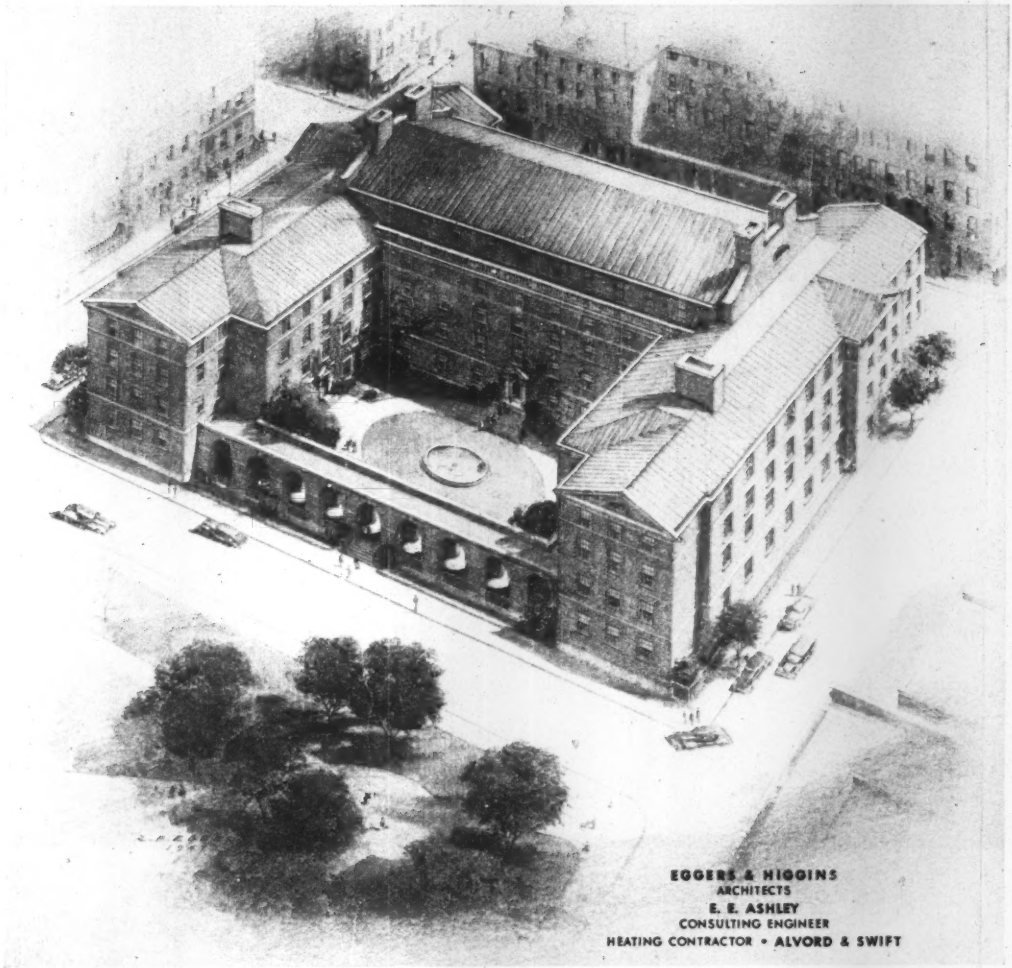
America's coal reserves are virtually inexhaustible; America's coal industry is the world's most productive and efficient. That's why coal has a future dependability of supply that no other fuel can offer. That's why, of all fuels, the price of coal is most likely to remain stable.

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!



EGGERS & HIGGINS
ARCHITECTS
E. E. ASHLEY
CONSULTING ENGINEER
HEATING CONTRACTOR • ALVORD & SWIFT

NEW YORK UNIVERSITY, LAW COLLEGE, WASHINGTON SQUARE, N. Y.

POWERS CONTROL ®

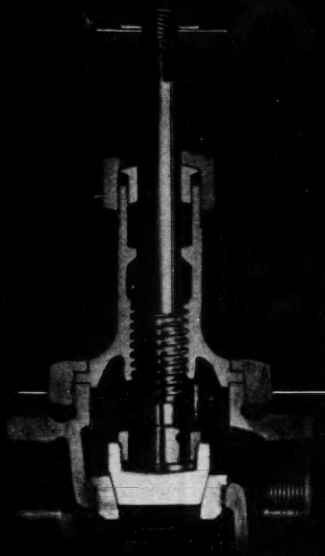
POWERS

Temperature and Humidity Control was selected for this distinguished building, outstanding for the excellence of its traditional design.

Here, 199 convectors are controlled by 54 Powers room thermostats. There are 30 complete air conditioning systems for summer cooling and dehumidifying, also winter ventilation and humidification—all are controlled by Powers equipment.

When you wish automatic temperature control which often gives 25 to 40 years of dependable service with a minimum of repairs, specify Powers. Over 60 years experience gained in supplying temperature control for many important buildings may be helpful to you in selecting the type best suited for your requirements. Contact our nearest office, there's no obligation. (a85)

Established in 1891 • **THE POWERS REGULATOR COMPANY** • SKOKIE, ILL. • Offices in Over 50 Cities



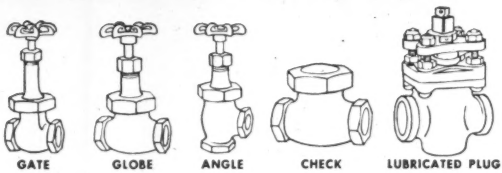
BRONZE

COMPLETE LINES OF BRONZE VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns, including Walseal® Bronze Valves and Fittings for making Silbraz® joints.

Walworth also manufactures complete lines of valves and fittings – including Lubricated Plug Valves – made of steel, iron, and special alloys as well as bronze.

Walworth-made valves, pipe fittings, and pipe wrenches, total approximately 50,000 items–all sold through distributors in principal centers throughout the world.

Let Walworth engineers help you with your problems. For full information call your local distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

WALWORTH

valves . . . pipe fittings . . . pipe wrenches

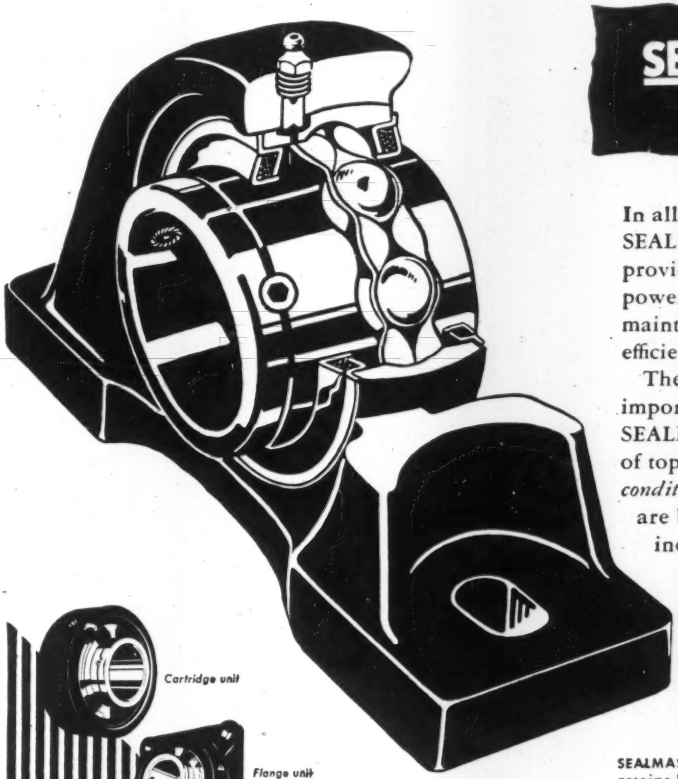
60 East 42nd Street, New York 17, N. Y.

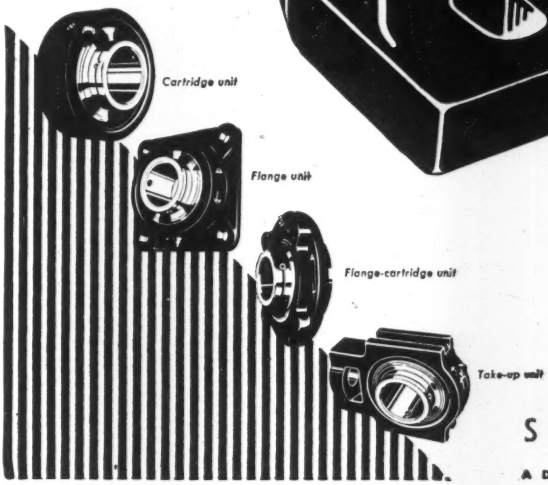
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Wherever used...

THEY ADD

BUILT-IN PERFORMANCE





SEALMASTER

BALL BEARING UNITS

In all types of machines, SEALMASTER Ball Bearing Units provide smoother operation, reduced power consumption, minimum maintenance and general all-round efficiency.

The exclusive combination of important features found only in SEALMASTERS is the best assurance of top performance *under all conditions*—superior qualities that are built right into each individual bearing.

Write for your copy of Catalog 845 which gives dimensions, load ratings and other data on the complete line of SealMaster Bearing units. If you have a special bearing problem ask one of our bearing specialists to assist you.

SEALMASTERS' patented centrifugal seal retains lubricant and excludes dirt. Self-aligning bearing assembly permits alignment without seal distortion. Factory-lubricated, ALL SEALMASTERS are shipped *ready for use.* Patented locking pin and dimple prevents rotation of outer race in housing and positions unit for relubrication.

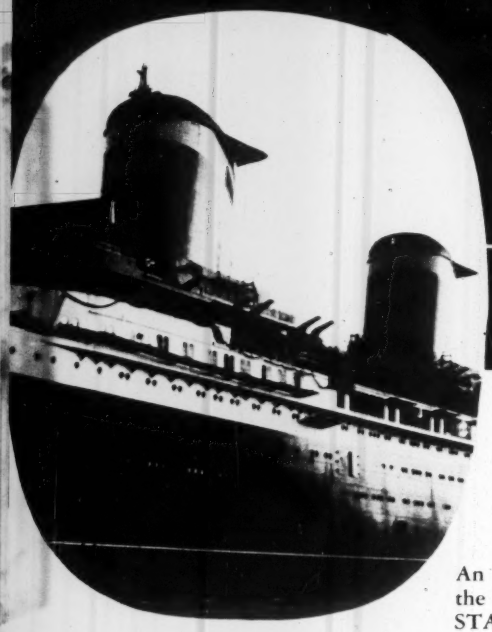
SEALMASTER BEARINGS

47 RIDGEWAY AVENUE, AURORA, ILLINOIS

A DIVISION OF STEPHENS-ADAMSON MFG. COMPANY

FACTORY REPRESENTATIVES AND DEALERS IN ALL PRINCIPAL CITIES

Super-liner "UNITED STATES"



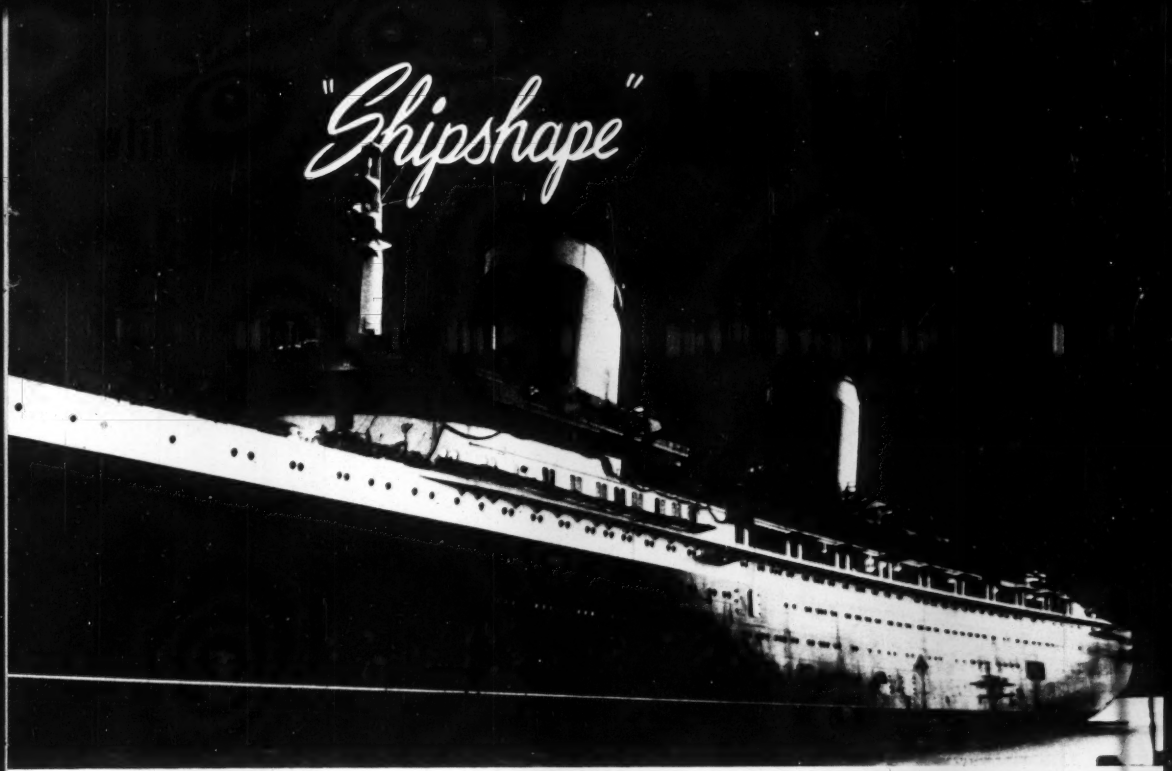
EXHAUST FANS IN GIANT STACKS

"Buffalo" Type "LL" Fans in the stacks of the UNITED STATES exhaust 90,000 cfm from sport decks, swimming pools, etc., discharging thru the stacks, high above decks.

OVER 200 "Buffalo"

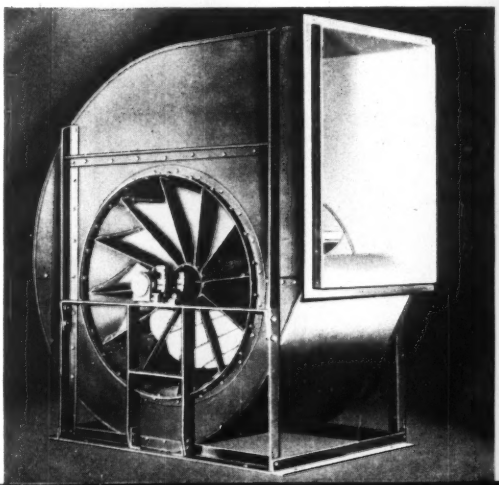
An outstanding fan job — supplying the air handling for the largest American-built liner afloat, the 990-ft. "UNITED STATES"! Stale air is exhausted from entire decks. Machinery spaces, boiler rooms and engine rooms are ventilated. Enormous quantities of air must be supplied for ship-wide air conditioning services. And continuous air supply is needed to operate special Vortex cleaners designed for cinder elimination.

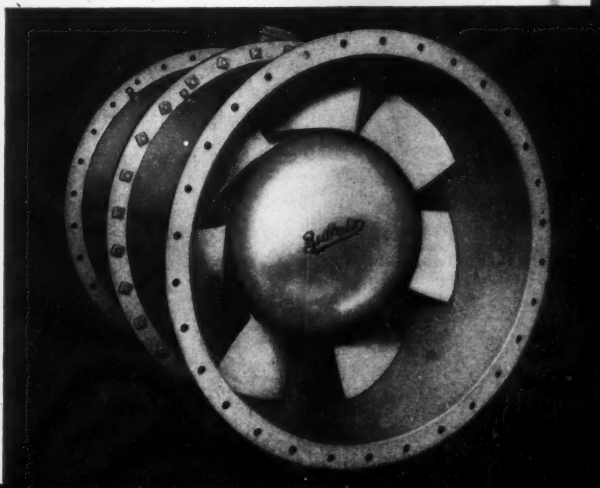
For these important jobs, "Buffalo" Fans were chosen exclusively — hundreds of them. The choice of these compact, durable, high-performance "Buffalo" fans is thoroughly in keeping with the high standards set by United States Lines Company. If *you* are planning an air handling installation, plan it with "Buffalo" fans, the make that leading firms specify.



The "UNITED STATES" was constructed by
Newport News Shipbuilding & Dry Dock Co.,
Newport News, Virginia.

FANS ASSURE IT!

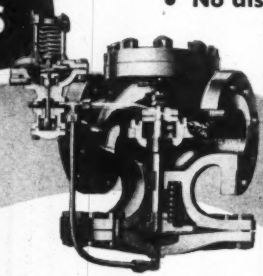




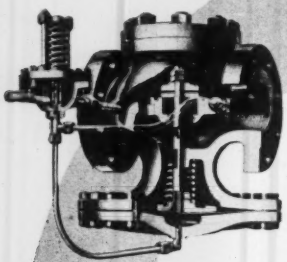
SAVE WITH SPENCE on all these jobs

Here are a few reasons why Spence Regulators give you accurate regulation and long, trouble-free life:

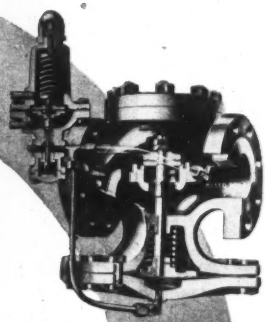
- **Single-seat Packless Construction**
- **Large Balanced Metal Diaphragm**
- **Sensitive Pilots**
- **SECO Metal Seats and Discs**
- **Springs out of path of steam**
- **No dismantling for inspection**



PRESSURE REDUCING—Self-operated, dead-end regulators powered by large, frictionless, metal diaphragms. Sizes ¼ in. to 12 in. Pressures to 600 psi 750 F.

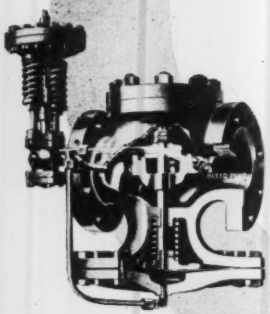


BACK PRESSURE CONTROL—Wide selection of sensitive pilots to meet exacting requirements. Initial pressure closing, guaranteed to shut tight. Packless construction, metal diaphragms.

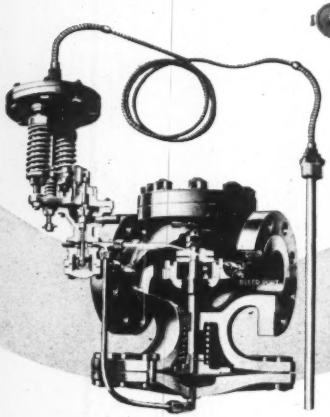


DIFFERENTIAL PRESSURE—Accurate control of delivery pressure at a constant, adjustable differential from 3 to 150 psi above another source of fluid pressure.

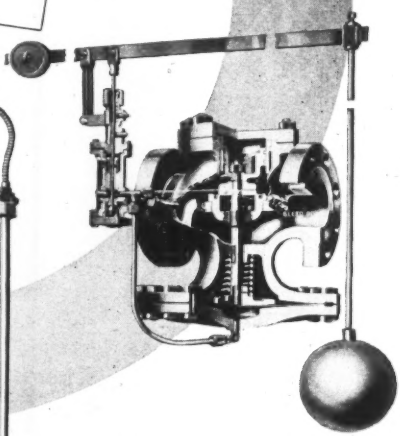
WRITE FOR BULLETIN 350
for complete details on Spence's line of automatic regulating valves



PUMP GOVERNOR—Constant or excess pressure control for steam pumps. Steam pressures to 600 psi 750 F, pump discharge pressures to 2000 psi.



TEMPERATURE REGULATING—Combined temperature and pressure control. No separate reducing valve required. Shuts tight, will not wiredraw or be damaged by overheating. Sizes to 12 in.

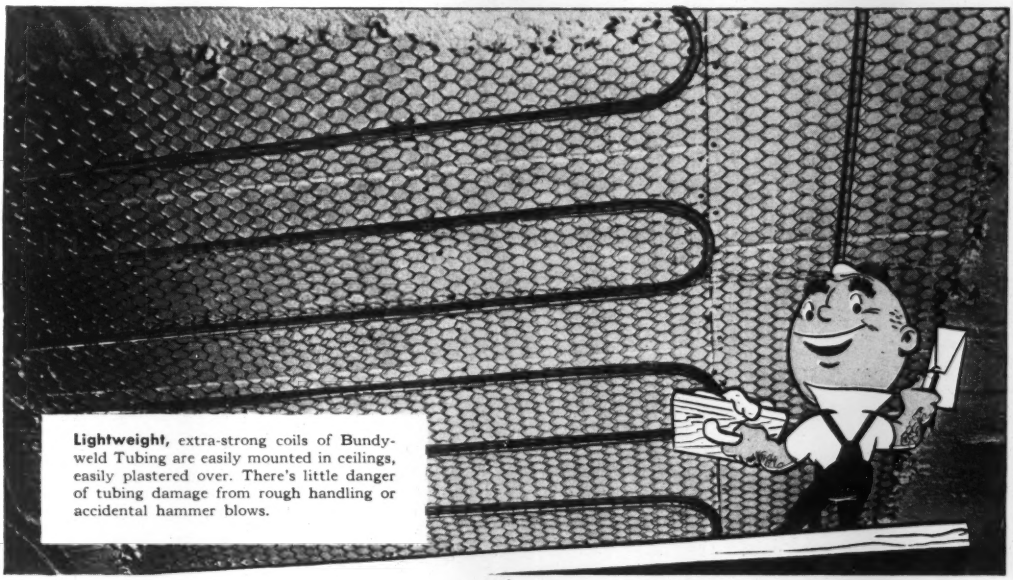


LEVER OPERATED—Pilot lever for connection by cable or mechanical linkage to floats or other devices. Slight actuator motion opens and closes main valve.

SE-11D

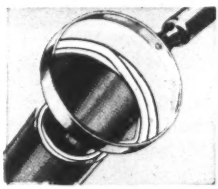
SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence



Lightweight, extra-strong coils of Bundyweld Tubing are easily mounted in ceilings, easily plastered over. There's little danger of tubing damage from rough handling or accidental hammer blows.

Forge ahead of your competitors with Bundyweld ceiling radiant heating



Key to Low Cost

Bundyweld is the only tubing double-walled from a single strip, copper-brazed through 360° of wall contact. It's leakproof, thinner walled, yet stronger. It transmits heat quickly, has high bursting strength. It saves up to 50% on material costs and installation time.

Standard 20′ or 24′ lengths of Bundyweld are easily formed into coils in shop or on job site. Expanded ends (furnished when specified) are quickly soldered into leakproof union. Joined, lightweight coils are easily mounted onto ceiling, quickly plastered over.

To thousands of users, Bundyweld ceiling radiant heating has already proved a cleaner, more economical, more convenient way to heat.

They in turn are selling friends on the idea of walls without dirt streaks, of warmth that's always even, of air that's fresh as spring.

But the biggest boom is coming from Bundy ads in *American Home* and in *Better Homes & Gardens.* People who are planning to buy a home now or later are sending in an avalanche of coupons. They want to know more about Bundyweld ceiling radiant heating. They want to know the names of builders and plumbing and heating contractors using it. These people are *your* prospects!

Why not place your business squarely in the middle of this interest? Why not move in ahead of your competition? Send the coupon!

Bundyweld
ceiling radiant heating

Radiant Heating Division
BUNDY TUBING COMPANY
Detroit 14, Michigan

Radiant Heating Division, Dept. HP-652
Bundy Tubing Company, Detroit 14, Michigan

☐ Send free 20-page nontechnical brochure explaining Bundyweld ceiling radiant heating.
☐ Send Bundy technical radiant heating pamphlet.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

50 years ago this month, Willis H. Carrier founded the air conditioning industry

A printer in Brooklyn was having his troubles. Moisture content of the air was making his paper swell and shrink. But nobody could do anything about that . . . or could they?

Willis Carrier, then a young engineer with Buffalo Forge Company, thought he could. He designed a system that controlled the temperature and relative humidity in that print shop, winter and summer. This was the pioneer air conditioning installation.

Dr. Carrier and his associates formed the company which today leads the industry. And Carrier Corporation has virtually written the history of air conditioning. Carrier created the machines, opened the markets, blazed the trails.

That you are kept comfortable by air conditioning in bus, plane and train . . . restaurant, store and theater . . . office, factory and home . . . is due to the pioneering of this one company.

But Carrier has made even more important *indirect* contributions to your well-being. For air conditioning is also a production tool that is essential to the manufacture of synthetic fabrics, radar and electronic equipment, pharmaceuticals, precision aircraft parts, optical instruments, photographic film and scores of other products.

Air conditioning is an important part of your life today. But tomorrow it will be more important. For this industry of ours is very young. And its field of service is unlimited.

Carrier

AIR CONDITIONING • REFRIGERATION

for 50 years—the people who know air conditioning best

And valuable man-hours are LOST by old style steam trap piping

Whether man-hours are lost by accidents or old style steam trap piping, they are costly. That's why hundreds of manufacturing plants are switching to Super-Silvertop* Steam Traps. The better design of these traps eliminates jungle piping. Three pipe connections in the head saves up to 50 minutes installation time and as many as 7 fittings. Since Super-Silvertops can be serviced without removing the trap from the line, 30 minutes time can be saved whenever you inspect, clean or service your trap. Because Super-Silvertop valve and seats are made of longer lasting Anderloy* and because the bucket is guided on a center tube eliminating bucket damage, trap failures and replacements are few and far between.

Don't be troubled with frequent servicing of steam traps. Don't waste precious man-hours. Send for your copy of "Solving Steam Trap Problems" today and see how Anderson Super-Silvertop Steam Traps reduce LOST MAN-HOURS.

*T. M. Reg. in U. S. Pat. Off.

SUPER-SILVERTOPS SAVE MONEY

THE V. D. ANDERSON COMPANY
1949 West 96th Street • Cleveland 2, Ohio

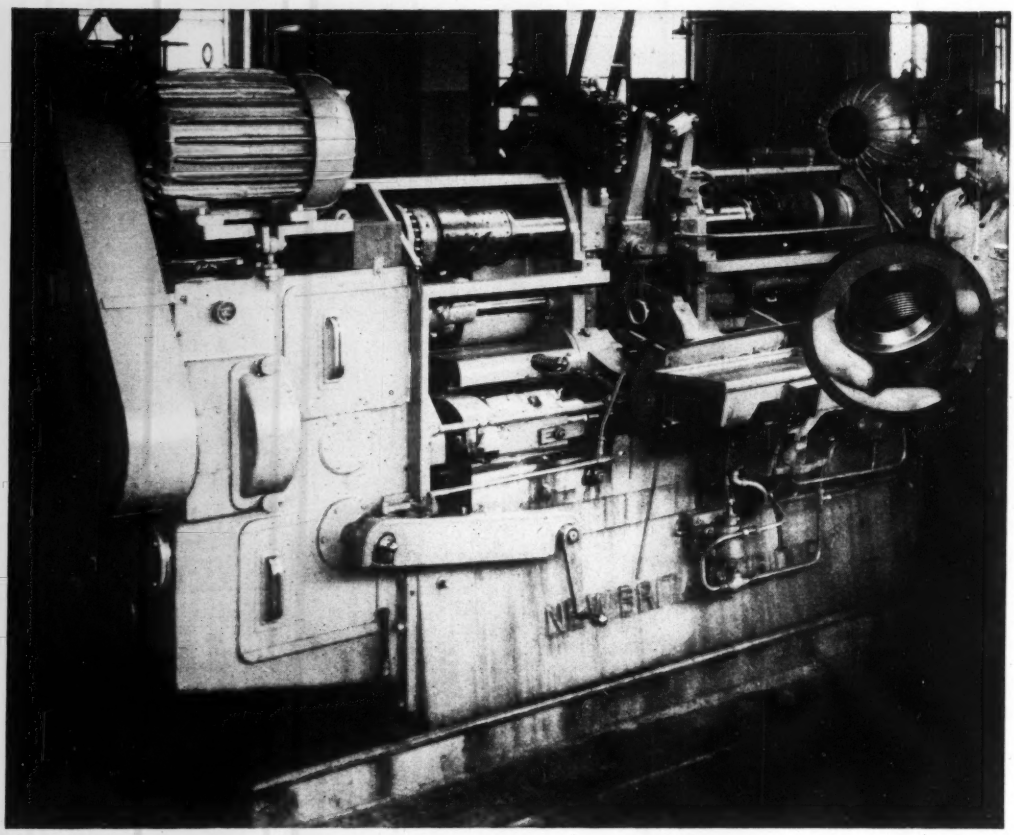
Gentlemen:
Please send without obligation "Solving Steam Trap Problems."

Name .....

Address .....

City ..... State .....

In Canada: Bawden Industries, Ltd. Toronto



This automatic machine finishes Branford Unions. Parts are fed singly into a jaw which rotates to several positions where both sides are rough and finish machined simultaneously. Parts are also threaded during the same cycle. Machining of both sides of parts in one holding assures the accuracy, alignment and precision of Branford Unions.

BRANFORD UNIONS

150-250-300 LBS. and A.A.R.

Branford's superiority results from the combination of fine materials, modern equipment and skilled craftsmanship . . . plus 88 years experience.

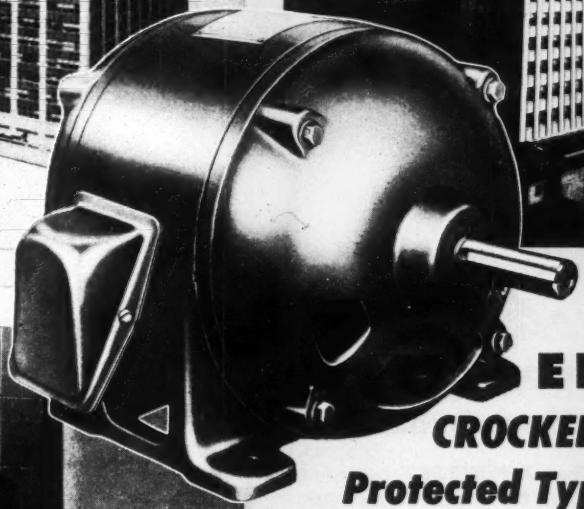
MALLEABLE IRON FITTINGS CO.

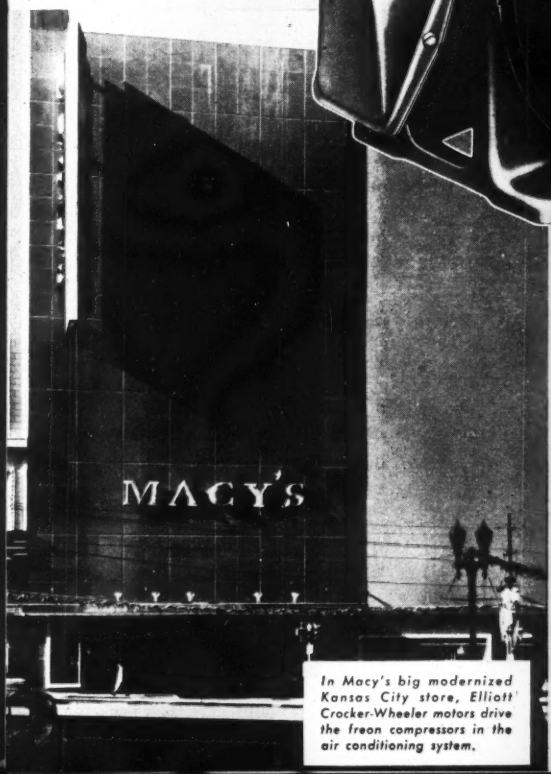
BRANFORD, CONNECTICUT

AS GOOD AS THE BUILDINGS THEY SERVE!

AT 100 PARK AVENUE, NEW YORK, 60 of these motors insure dependable air conditioning.

THE NEW 525 WILLIAM PENN PLACE BUILDING, PITTSBURGH, has 95 Elliott Crocker-Wheeler motors to serve its "two-zone" air conditioning system.





In Macy's big modernized Kansas City store, Elliott Crocker-Wheeler motors drive the freon compressors in the air conditioning system.

ELLIOTT CROCKER-WHEELER Protected Type MOTORS

● You'll see them in many fine modern buildings, always in positions of trust, where the success of functions vital to comfort and liveability depends upon their reliable operation. They drive the various pumps, fans, blowers and compressors that temper frigid blasts or torrid heat to uniform indoor ease, summer and winter. They are motors which will guard the reputation of a heating contractor, builder or architect as safely as they guard comfort in the buildings they serve.

In NEMA frames 203-505 inclusive and larger. Vertical, NEMA C Face or D Flange mountings. All standard voltages and frequencies. Also available with brake. Write for Bulletin 6000-1.

ELLIOTT Company

CROCKER-WHEELER DIVISION

AMPERE, N. J.

For larger motors: RIDGWAY DIV., RIDGWAY, PA.

PLANTS AT: JEANNETTE, PA. • RIDGWAY, PA. AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

BRANCH OFFICES & REPRESENTATIVES IN PRINCIPAL CITIES

ELLIOTT *Approved* SERVICE SHOPS COVER THE COUNTRY

W2-17

saves installation dollars

solves every important air distribution problem

for the *OWNER* • *ARCHITECT* *ENGINEER* • *CONTRACTOR*

- Complete concealment.
- Panel locations determined solely by load considerations.
- Relocation of partitions requires no panel alterations.
- Exceptional uniformity and control of room temperature.
- The highest loads and ventilating requirements handled with a total absence of strong air streams.
- System design, installation, and balancing extremely simple and rapid.

Material and labor saving installation features

1—Shop built duct work installed and system balancing completed prior to and independent of ceiling erection.

2—No additional material, structural work, turndown collars or rigid connections requiring close fitting, sealing or calking are involved.

3—All components of Modular Multi-Vent panels are quickly and easily assembled, attached and aligned in the ceiling by hand without the use of tools. No cutting or reshaping of standard ceiling materials is necessary.

4—Existing air distribution systems can be readily and economically converted to Modular Multi-Vent.

Write for bulletin 385 with complete details and specification data.

MULTI-VENT DIVISION

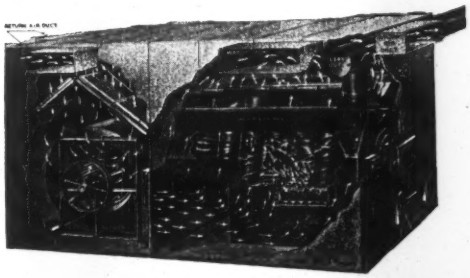
THE PYLE-NATIONAL COMPANY
1373 North Kostner Ave., Chicago 51, Ill.

WARM AIR HEATED... by Campbell

Bethlehem Lutheran Church, Mason City, Iowa. Heated with a combination gas-oil Campbell 8000 Unit. Hugo C. Haeuser, Milwaukee, Wisc., Architect. Davey & Moen, Mason City, General Contractor.

An Outstanding Church Installation

Architects, engineers and contractors are finding that Campbell Heaters meet every requirement for church heating. They provide fast heat delivery; positive control of temperature, humidity and ventilation; quiet operation, and outstanding fuel economy. Easily adapted for summer air conditioning. And very easy to install. Available for all fuels in capacities up to 2,160,000 BTUs.



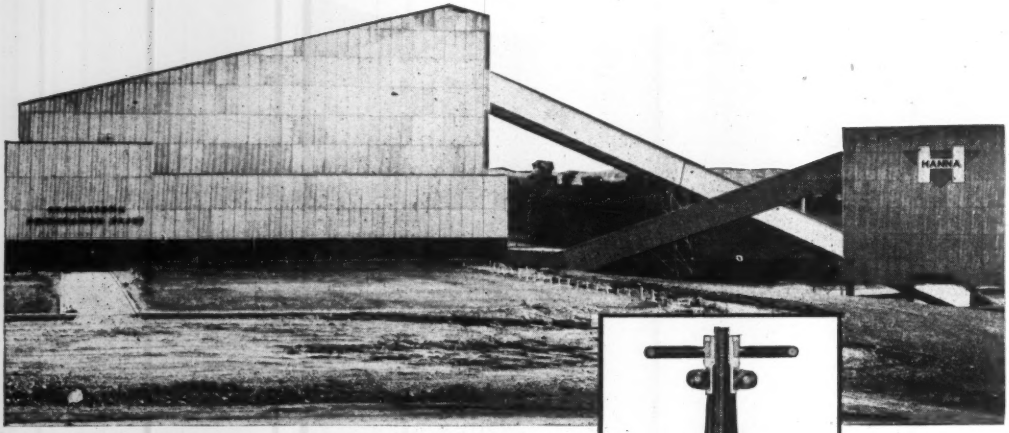
SPECIAL UNITS FOR DRYING & PROCESSING

We build direct oil and gas-fired units up to 14,000,000 BTUs.

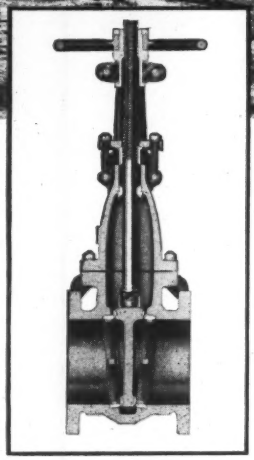
CAMPBELL HEATING COMPANY

Des Moines 17, Iowa

Hanna Coal Company Preparation Plant ... served by the OIC LONG LINE of valves



Hanna Coal Company's mammoth new coal preparation plant in service now at Georgetown, Ohio.



"We've standardized on OIC Valves; all kinds for all kinds of service. They're the best!"

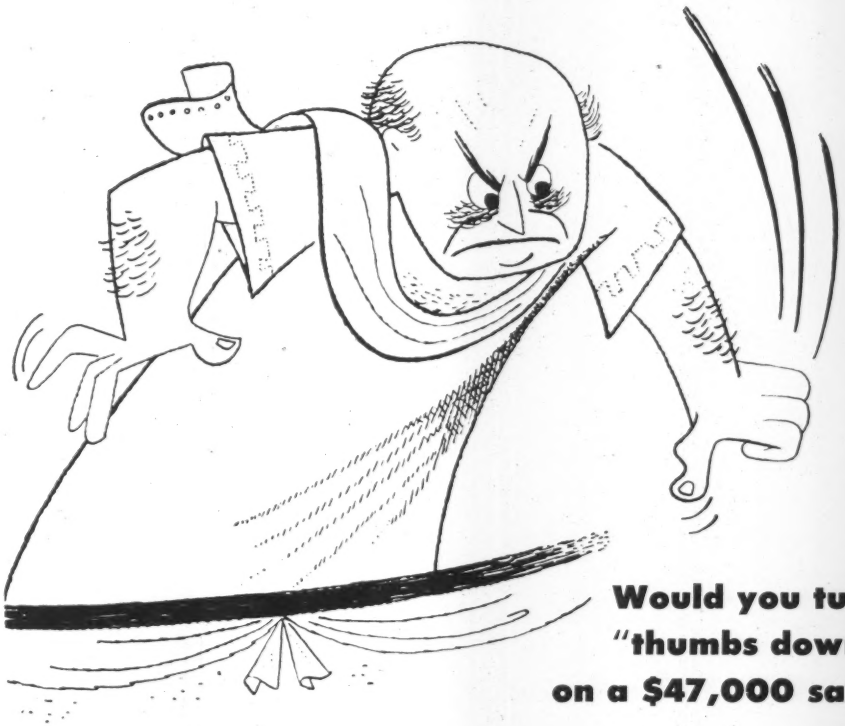
Hundreds of OIC Valves—iron, bronze and steel—were used in this coal preparation plant, completed just a year ago. OIC Valves were selected by Hanna Coal Company after many years' experience with these valves at their other properties—evidence of the fine performance they provide.

Simplify your procurement problems by calling the nearby OIC distributor. The OIC Long Line offers the right valve for every job.

THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES
FORGED AND CAST STEEL · IRON · BRONZE



Would you turn "thumbs down" on a $47,000 saving?

ALUMINUM COMPANY OF AMERICA didn't. They made Dorex Air Recovery part of the air conditioning system for their new building in Pittsburgh. This cut the required air intake almost in half and saved some $47,000 on original heating and cooling equipment. In addition, they'll save several thousand dollars a year in operating costs from now on.

Percentage-wise, this is typical of every Dorex Air Recovery installation. Averages, drawn from 20 years' experience and more than 10,000 Dorex installations, show that every $100 invested in Dorex Air Recovery should return about a $400 saving in original cost of heating and cooling equipment...and every $1 spent for Dorex maintenance should save some $4 in operating costs.

Dorex Air Recovery is a simple method by which stale air can be purified—made completely fresh for re-use. Thus, the amount of outside air that has to be taken into the system can be reduced by as much as two-thirds. This means less original investment, less operating expense . . . a saving, not only in money but from 1/3 to 1/2 in critical material needed.

Find out more about Dorex Air Recovery — what it has done for others, what it can save you. The coupon clipped to your letterhead will bring full information promptly.

DOREX TRADE MARK "DOREX" REG. U.S. PAT. OFF.
Air Recovery

W.B.CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. A-72, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

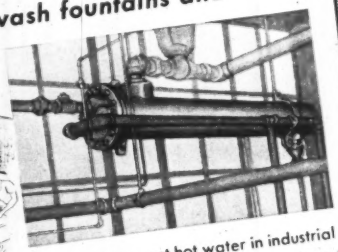
Name .....
Position .....
Company .....
Street .....
City ..... Zone ..... State .....

TACO *has a proved record of helping*

FACTORIES • OFFICE BUILDINGS • SCHOOLS • HOSPITALS • CHURCHES • STORES

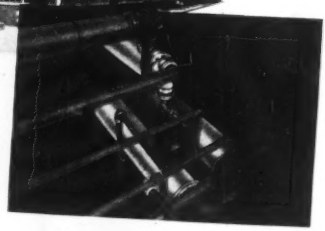
SOLVE THEIR HEAT and HOT WATER PROBLEMS . . .

Provides hot water for wash fountains and showers for employees

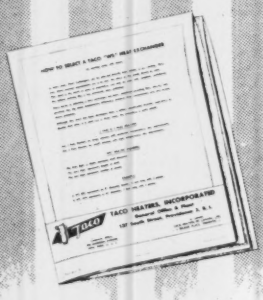


Taco water heaters are supplying abundant low cost hot water in industrial plants throughout the United States. Our more than 30 years' experience in this field is a big help to those with hot water heating problems.

Heats entire building with heat formerly thrown away



A large industrial user of steam was dumping the condensate from their steam processing into a creek. Now, thanks to the 3 Taco heat exchangers on the right, they're reclaiming enough to heat the 220′ x 560′ building shown above. Taco products can perhaps do a similar service for you.



ENGINEERS . . . WRITE FOR

simplified selection chart for sizing Taco water heaters under any conditions such as steam pressure, temperature rise and pressure drop.

Better Heating-Better with Taco

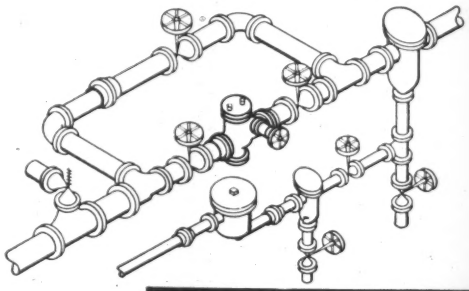
TACO HEATERS, INCORPORATED

A TRAINED TACO SALES ENGINEER IS AVAILABLE WHENEVER YOU NEED HIS HELP

137 SOUTH STREET • PROVIDENCE 3, R. I.

Can Your Pressure Regulators Match This Service Record?

...on a Steam Kettle for instance



THE INSTALLATION

On steam supply line to cooking kettle, Schoenling Brewing Company, Cincinnati.

THE HISTORY

Specifications for this installation called for a regulator to reduce main line steam supply at 100 psi to 30 psi, and automatically maintain the reduced pressure to cooker, 24 hours daily, without significant fluctuation.

A Crane Pressure Regulator with factory pre-set range was selected and properly installed with adequate, automatic drainage of the steam lines.

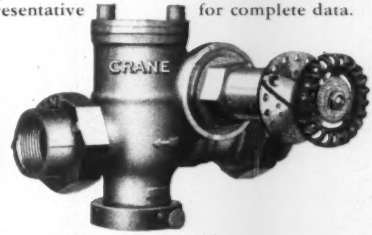
For 16 years, throughout its lifetime, the Crane Pressure Regulator did its job to the brewery's complete satisfaction. Never was it out of service; never did it require more than the simple prescribed periodic inspection. (Note: current model has renewable wearing parts; will virtually never wear out.)

VALVE SERVICE RATINGS

SERVICE LIFE:	16 years - 24 hours per day
MAINTENANCE COST:	None - simple servicing only
SPECIAL FEATURES:	Good pressure range - easy adjustment
SUITABILITY:	Steady flow - no pressure build-up
OPERATING RESULTS:	Accurate control of cooking process
PRICE:	Low - considering service life
AVAILABILITY:	Stock item - Crane line

THE VALVE

Crane No. 960 Brass Pressure Regulators are made for reducing steam or air pressures up to 250 pounds, to within 80% of inlet pressure. They are factory pre-set to operate within any of 4 ranges from 1 to 200 pounds, with easily selected outlet pressure within set range. Precision made, they are fully automatic, highly dependable, even under reasonable fluctuation of inlet pressure. All wearing parts renewable. See your Crane Catalog or Crane Representative for complete data.



The Complete Crane Line Meets All Valve Needs. That's Why

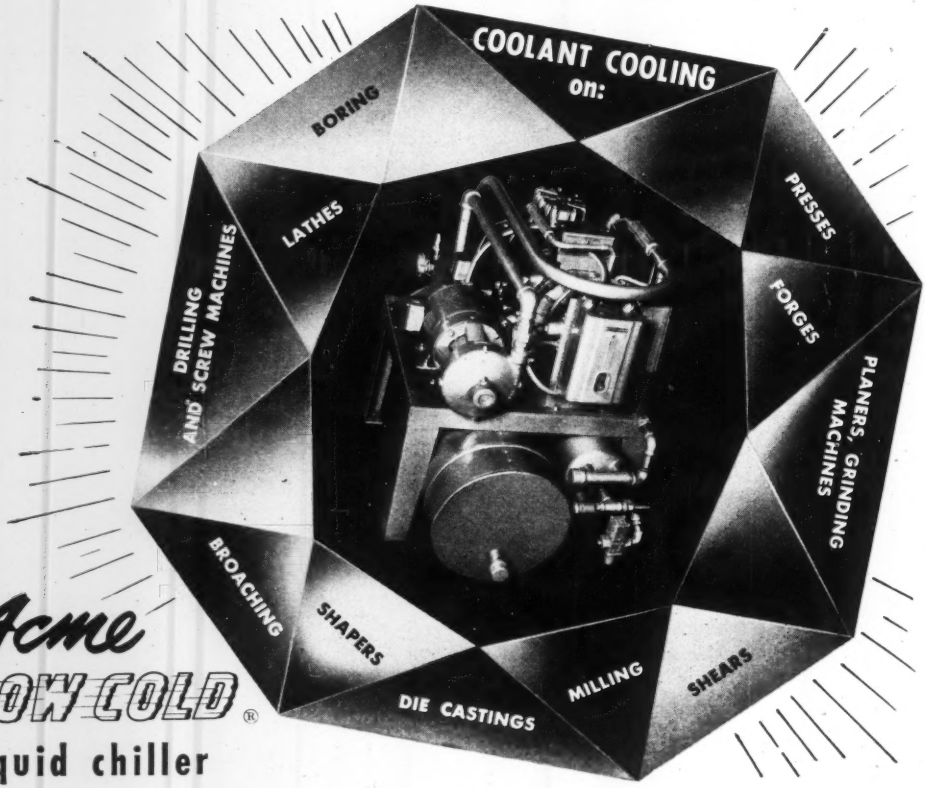
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



Acme FLOW COLD® liquid chiller

. . . a "jewel" of many facets

Just as the many facets on a perfect diamond are mute testimony to the diamond cutter's skill, so are the many applications of the Flow Cold unit testimony of the skill of ACME design engineers. Wherever you need to maintain temperatures of coolants for any industrial process, the Flow Cold unit is easily adapted. Gives you exact temperature control which means uniform production quality and maintenance of closer tolerances. Can also be applied to the maintenance of solution temperatures in plating, anodizing and welding processes. Increase production quantity and quality through the use of Flow Cold. Moreover, it is the perfect chilling unit for central drinking water systems, and for home, office, or business air conditioning. Write us today!

FLOW COLD UNITS...

- ★ are self contained
- ★ are compact
- ★ are easy to install
- ★ are factory tested and assembled
- ★ are economical
- ★ are efficient
- ★ come in 6 models — 2 to 15 H. P.

ACME also manufactures:

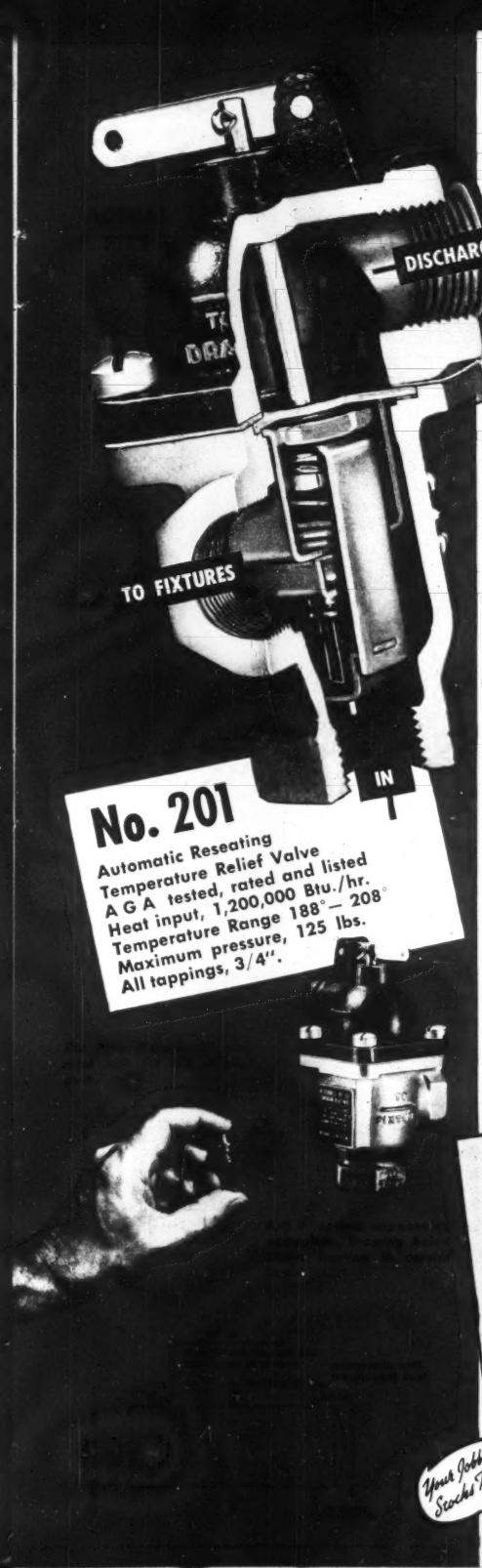
Dry-Ex* Water Chillers, Hi Peak* Water Coolers, evaporative condensers, shell and coil and shell and tube condensers, fin coils, cooling towers, oil separators, liquid receivers, heat exchangers. Write us today for any information you desire about the Flow Cold unit, or about any of the other articles we manufacture.

*Trade Mark

ACME INDUSTRIES, INC., Jackson, Mich.

Flow Cold Division

CONTINUOUSLY SERVING THE AIR CONDITIONING AND REFRIGERATION INDUSTRY SINCE 1919



"...the only sure-footed temperature relief valve I've ever seen!"

That's what a consulting engineer had to say about the McDonnell No. 201 Temperature Relief Valve. It's one of the many prized compliments that are coming in now that hundreds of these valves are in service telling their own convincing story on the job.

We particularly like the way contractors are describing the No. 201 with words like "sure-footed" and "positive." For that's exactly what former temperature valves were *not*, and exactly what this valve *is*.

Yes, positive and precise operation is what contractors have been seeking for a long time in a temperature relief valve — a valve that will open up at a predetermined temperature; do its job; then close drip-tight as soon as its job is done. No wonder so many of them have been startled to find that this has finally been accomplished in the No. 201.

The illustrations show how we did it. We designed a valve with big, free-flowing waterways (equal to ¾-inch pipe) and made an extra tapping so that the service-flow can pass right through the valve (see Installation drawing). As a result, the thermostatic element is always subjected to the actual temperature at which the water is used.

For the thermostatic element we developed an adaptation of the ingenious Vernatherm element. This little element can be held in the palm of your hand; yet it has the power to easily open the valve at 188°F. and lift it to full opening at 208°F. The Valve reseats drip-tight when temperature at element drops down only five degrees below opening temperature.

Other advanced features of the No. 201 are listed below. Note its big, A G A tested capacity,* pull-down test lever, better construction throughout. Ask for Bulletin L-107 giving complete details.

McDONNELL & MILLER, INC., 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

McDONNELL

Boiler Safety Devices

No. 201

Automatic Reseating
Temperature Relief Valve
A G A tested, rated and listed
Heat input, 1,200,000 Btu./hr.
Temperature Range 188°— 208°
Maximum pressure, 125 lbs.
All tappings, 3/4".

Never before a valve like this

Positive operation: Starts to open when water surrounding thermostatic element reaches 188° F.; discharges full capacity at 208° F.; reseats drip-tight automatically when temperature drops to 183° F. Plenty of power to open or close under all conditions.

Can be located right in service flow. Something new has been added: a fixture tapping is provided (in addition to usual tank and drain tappings), so service water will pass right over the temperature element (see installation diagram). This assures immediate response to temperature changes; eliminates air pockets in valve; often cuts piping costs.

Free flowing waterways: Provides generous clearances to prevent clogging.

Big heat dissipating capacity: A G A tested, rated, and listed on nameplate, for heat input of 1,200,000 Btu./hr.*

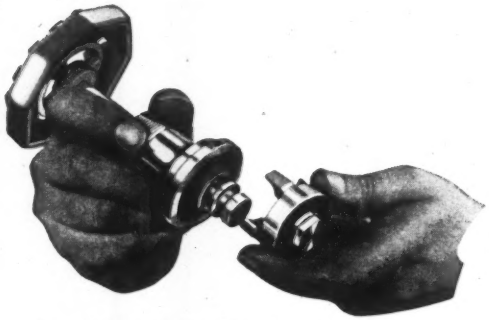
McDonnell quality: All parts which are actually in contact with water are non-ferrous metals. Valve disc is newest development in silicones.

* The A G A capacity rating is based on water discharge because the successful operation of a temperature relief valve necessarily assumes adequate cool water replacement. Note, however, that if for any reason water supply fails, temperature and pressure can continue to climb in spite of the No. 201. Therefore a full regard for safety suggests the use of an ASME pressure relief valve rated in *steam* discharge capacity, such as the McDonnell No. 33 series Btu-rated Safety Relief Valves in addition to the No. 201.

Your Jobber Stocks Them

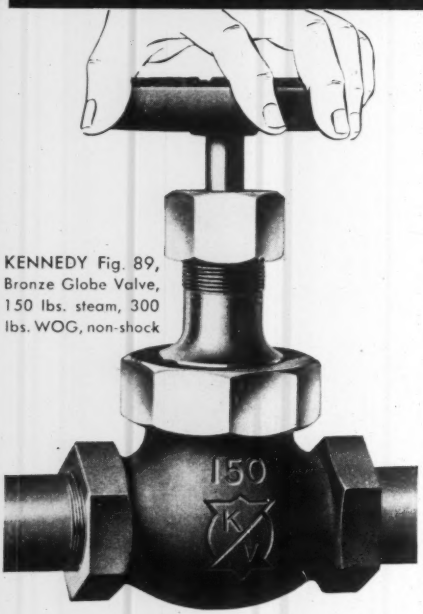
KENNEDY

bronze globe valves...



SLIP-ON DISC HOLDER—This unique disc holder locks on securely wth stem in wide-open position . . . yet releases by a half-turn of the stem when bonnet assembly is removed.

JOB-FITTED for longer service... easier maintenance



KENNEDY Fig. 89, Bronze Globe Valve, 150 lbs. steam, 300 lbs. WOG, non-shock

YOU KEEP MAINTENANCE COSTS DOWN with KENNEDY Bronze Valves because they are *job-fitted* . . . every valve specially designed and engineered for the job it has to do.

THE KENNEDY FIG. 89, for example, is designed for services where frequent inspection, cleaning of internal parts and quick renewal of the composition disc are required.

HEAVY UNION BONNET RING permits easy dismantling and reassembly of the valve without risk of damage to body-bonnet bearing surfaces.

THE RENEWABLE COMPOSITION DISCS are available in a variety of materials to meet a wide range of fluid, pressure and temperature requirements.

RUGGED BODY has an unusually high seat to prolong disc life by utilizing full thickness of disc before disc-holder strikes the base of the raised seat.

LONG-WEARING PACKING—molded rings of lubricated asbestos—maintains easy operation and tight seal to prevent leaks. Valve can be repacked under pressure when wide open.

FOR BEST RESULTS and real economy, standardize on KENNEDY Bronze Valves . . . and the complete line of KENNEDY Iron Valves, Malleable, Cast-Iron and Bronze Pipe Fittings . . . WRITE FOR CIRCULAR 101.

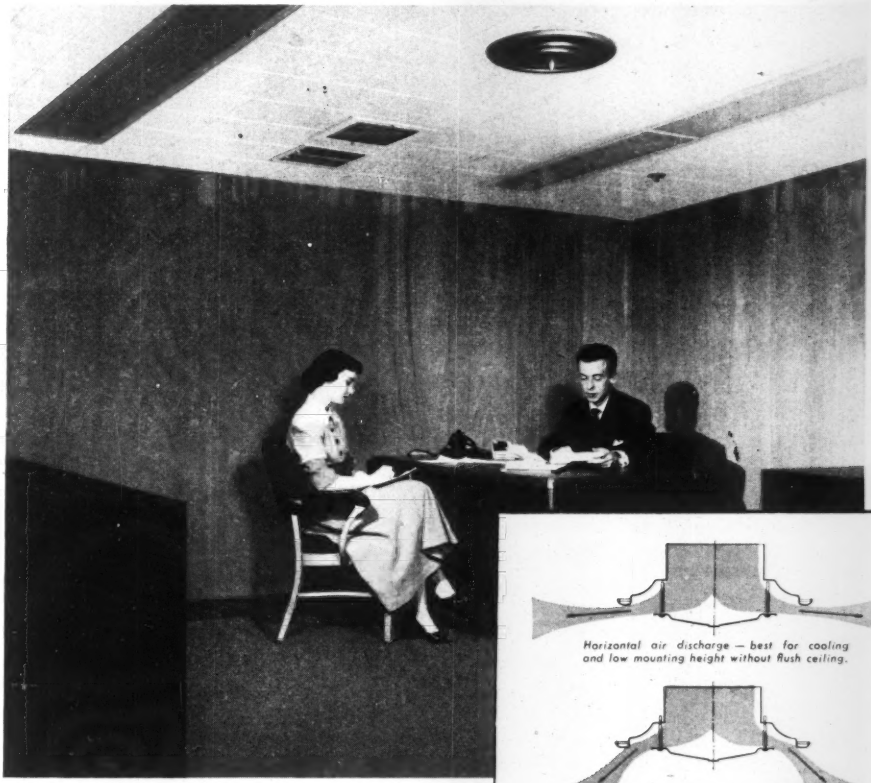
BUY FROM YOUR LOCAL DISTRIBUTOR

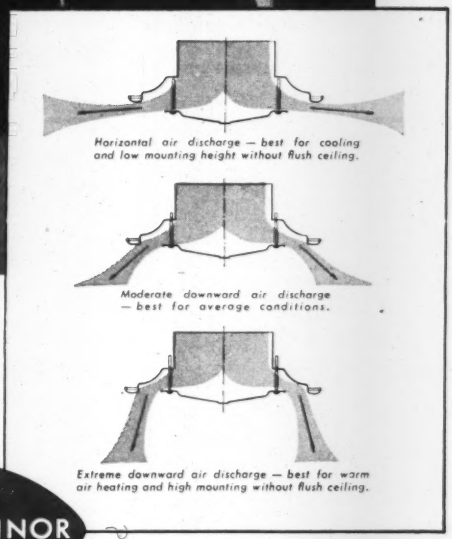
KENNEDY JOB-FITTED VALVES

THE KENNEDY VALVE MFG. CO.
ELMIRA, NEW YORK

VALVES • PIPE FITTINGS • FIRE HYDRANTS

Seneca Textile's new building, New York City. Architects and Engineers: Alfons Bach, Inc. Contractors: George A. Fuller Co.




Horizontal air discharge — best for cooling and low mounting height without flush ceiling.
Moderate downward air discharge — best for average conditions.
Extreme downward air discharge — best for warm air heating and high mounting without flush ceiling.

Handsome air diffusers that do a better job

● With no other tool than a screw driver, you can easily and accurately adjust the air flow from a Kno-Draft Air Diffuser from horizontal to almost vertically downward — and do it *after* installation.

Think what this can mean in reducing your preliminary figuring for a job . . . and increasing customer satisfaction with the operation of the system. Kno-Draft *Adjustable* Air Diffusers are top performers under all conditions.

Yet adjustability after installation is only one of many reasons why Kno-Draft Air Diffusers are rapidly becoming the preferred units for both commercial and industrial installations.

For the complete Kno-Draft story, mail the coupon today to W. B. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR

kno·draft

adjustable air diffusers

W. B. CONNOR ENGINEERING CORP.
Dept. G-72, Danbury, Connecticut

Please send me the *new edition* of the Kno-Draft Data Book—without obligation, of course.

Name .....

Position .....

Company .....

Street .....

City ..... **Zone** ..... **State** .....

NEW

HEAT SAVING EFFICIENCY

with Mundet 85% Magnesia

Send for Complete New Catalog

Mundet district offices are conveniently located coast-to-coast.

ATLANTA
339-41 Elizabeth Street, N.E.

BALTIMORE 30
612 Battery Ave.

BOSTON
57 Regent St., North Cambridge 40

CHARLOTTE 3, N. C.
507 S. Cedar Street

CINCINNATI 2
427 West 4th Street

DALLAS 10
601 Second Ave.

DETROIT 21
14401 Prairie Avenue

HOUSTON 1
Commerce and Palmer Streets

INDIANAPOLIS 4
15 E. Washington St.

JACKSONVILLE 6, FLA.
800 E. Bay St.

KANSAS CITY 7, MO.
1401 St. Louis Avenue

KNOXVILLE
1221 Grand Avenue

LOS ANGELES
(Maywood)
6116 Walker Avenue

NEW ORLEANS 16
315-25 N. Front Street

NEW YORK 17
331 Madison Ave.

PHILADELPHIA 39
856 N. 48th Street

ST. LOUIS 9
3176 Brannon Ave.

SAN FRANCISCO 7
440 Brannan Street

In Canada:
Mundet Cork & Insulation, Ltd.
35 Booth Avenue, Toronto

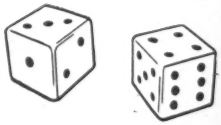
Now available in pipe covering and block insulation, Mundet Custom-Molded 85% Magnesia permits new heat-saving efficiency.

You benefit from these advantages when you use Mundet 85% Magnesia Insulation.

- ***Easier to Apply***
  It cuts easily and cleanly, even without canvas support. No chipping, crumbling or "powdering." Blocks score cleanly.
- ***Lighter Weight***
  Only 11 lbs. per cubic foot density. Even larger sizes and thicknesses are easy for one man to handle.
- ***Controlled Uniformity***
  Precision manufacture on the latest type of equipment insures uniform standards.
- ***More Durable***
  Greater "ductile strength" is built into the insulation. It does not "powder," settle or disintegrate even with heavy vibration. It withstands handling and may be removed and reapplied if necessary.
- ***Does not Shrink or Warp***
  Steam or water leakage does not affect it. It does not shrink or warp even after soaking.
- ***Attractive Smooth Finish***
  No unsightly, inefficient "bagging." Mundet 85% Magnesia insulation retains its neat appearance and effectiveness.
- ***Precision Pipe Fit***
  No spaces are left for the escape of heat. The whole heated surface is snugly enclosed.

Write for specification information and recommendations. Mundet Cork Corporation, Insulation Division, 7113 Tonnelle Avenue, North Bergen, N. J.

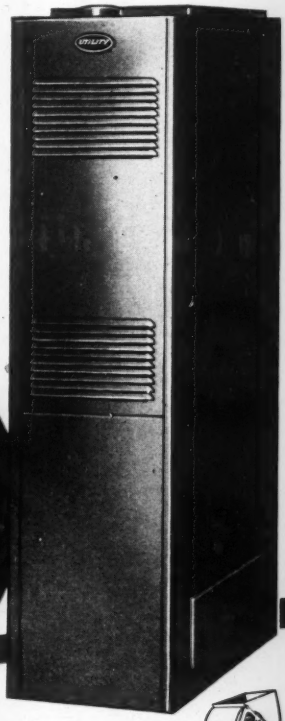
INSULATION FOR HIGH AND LOW TEMPERATURE



IT'S A NATURAL!

UTILITY'S NE

100



Let the chips fall your way!

Why gamble with ordinary heating equipment when you've got a *natural* winner with Utility's newly-developed 100FA Forced Air Furnace! The 100FA is the big brother of the sensationally successful Utility 70FA. And the 100FA should be just as popular with your customers for the same reasons: Extremely high heating performance (100,000 BTU input) at an unbelievably low price—luxury *forced air* heating for no more than ordinary installations. The 100FA will be popular with *you*, too, because its lower price lets you underbid competition profitably, lets you increase your net through lower installation costs and fewer costly call-backs. Send for FREE information today. Start pulling in the chips *now* on new and replacement sales with the easy-selling, profit-making Utility 100FA! AGA approved for zero clearance...uses only 19" x 25½" floor space.

DY-REKT* DRIVE BLOWER
—Constantly variable speed blower control permits correct air flow for any installation, without belts or pulleys.

SY-LENT* HEAT EXCHANGER
—Exclusive with Utility... allows for heat expansion and contraction without the "cracking" sounds so annoying to home owners.

Guaranteed Heating Performance

UTILITY
TRADE MARK

SEE THE COMPLETE UTILITY LINE TODAY AT YOUR DEALER'S!

Blowers

Air Coolers

Automatic Gas Ranges

DELIVERIES NOW!

UTILITY APPLIANCE CORP. C-752
4851 S. Alameda St., Los Angeles 58, Calif.

Please send me FREE information about Utility's new 100FA Forced Air Furnace and the *complete* Utility line.

Name_____

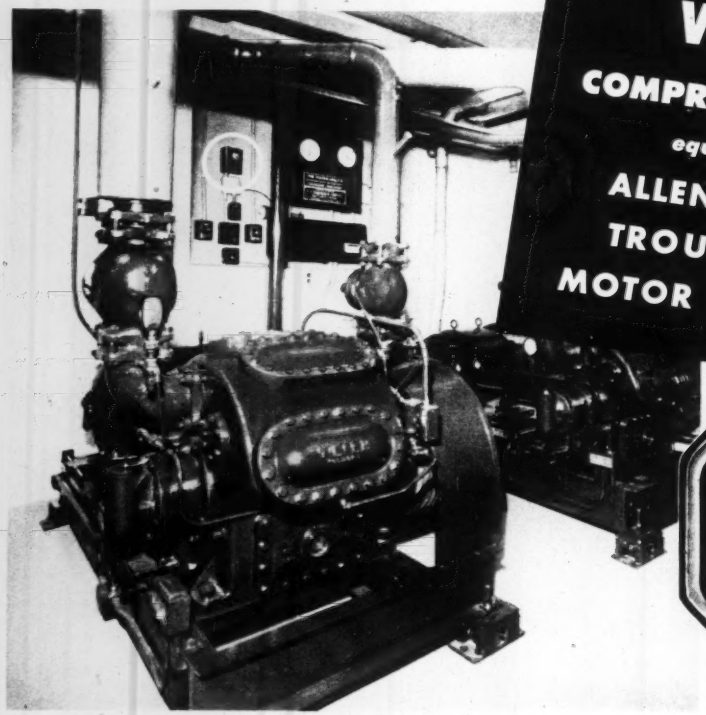
Address_____

City_____ Zone____ State_____

UTILITY APPLIANCE CORP. 4851 South Alameda Street, Los Angeles 58, Calif.

MANUFACTURERS OF AIR COOLERS, BLOWERS, GAFFERS & SATTLER AND OCCIDENTAL AUTOMATIC GAS RANGES

Two Vilter VMC Freon Compressors, installed in a Kansas City bank, equipped with Allen-Bradley trouble free Solenoid Starters.



VILTER COMPRESSOR UNITS equipped with ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

A-B Quality

Why are Allen-Bradley automatic starters so popular for refrigeration and air-conditioning service? . . . Because they are trouble-free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley cadmium silver alloy contacts never need cleaning, filing, or dressing.

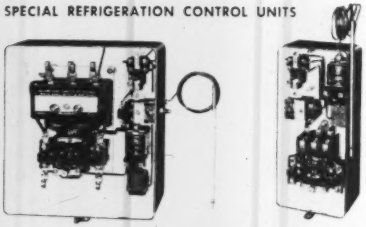
Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

Allen-Bradley Co., 1335 S. First St., Milwaukee 4, Wis.

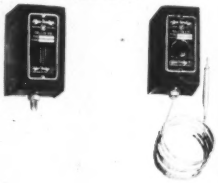
Typical Refrigeration Controls

SPECIAL REFRIGERATION CONTROL UNITS



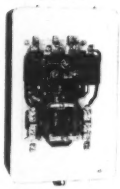
The two units above show Allen-Bradley special refrigeration control units consisting of Solenoid Starter, High Pressure Cutout, Thermostat, and Manual Starting Switch. Size 2 Unit at left, Size 1 Unit at right.

PRESSURE AND TEMPERATURE CONTROLS



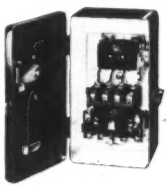
A-B Bulletin 836 Pressure Control and A-B Bulletin 837 Temperature Control. Accurate, rugged, compact units.

AUTOMATIC STARTER



A-B Bulletin 709 Solenoid Starter. Note white interior.

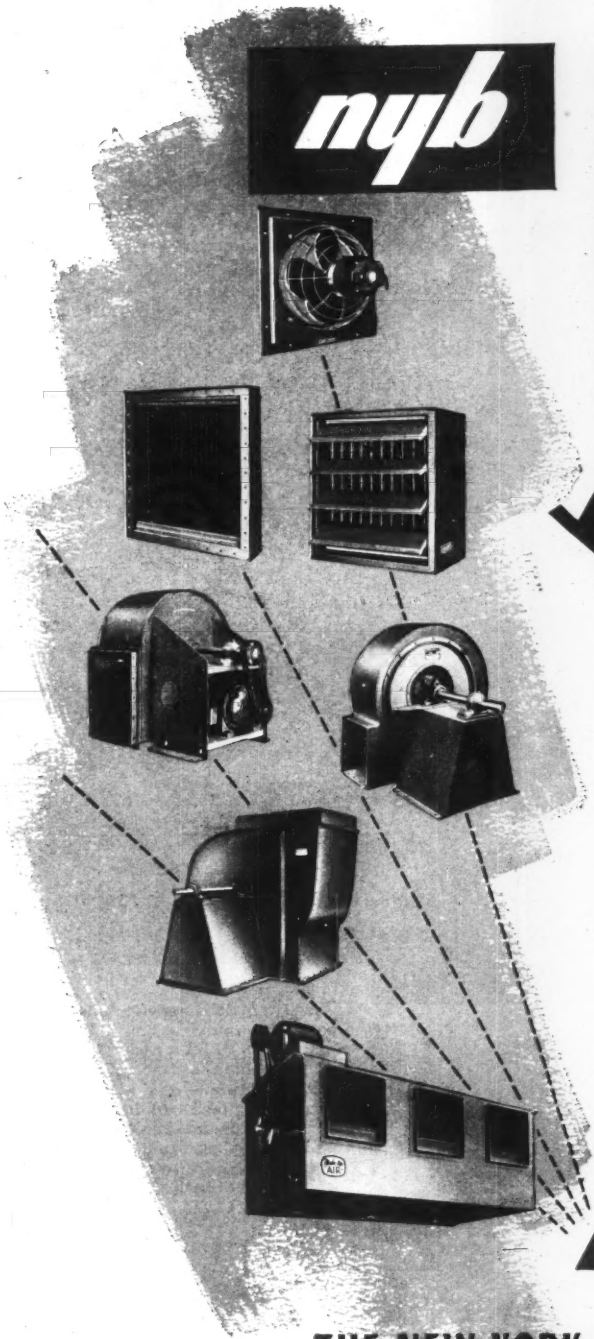
COMBINATION STARTER



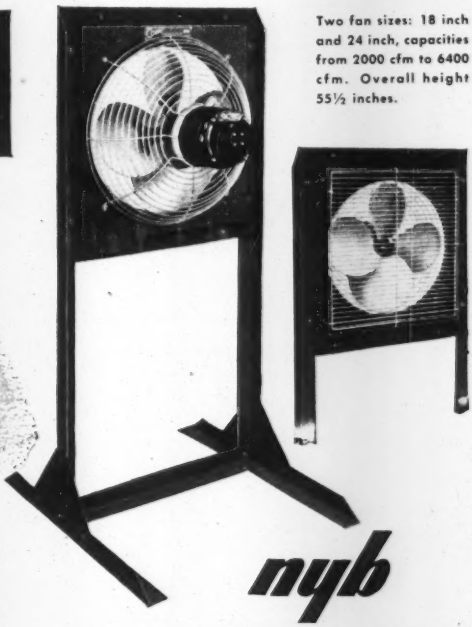
A-B Bulletin 712 disconnect switch type combination starter. Saves installation time.

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

nyb



Two fan sizes: 18 inch and 24 inch, capacities from 2000 cfm to 6400 cfm. Overall height 55½ inches.



nyb

PEDESTAL FAN

(Industrial Type)

Available for Prompt Shipment From Stock

Place this versatile fan in the most effective spot to deliver a gentle breeze or a brisk wind for a variety of uses. Safety guards front and rear with totally enclosed motors to meet State Industrial Safety Code Requirements. Bolted construction simplifies shipment, assembly and storage.

Write for Bulletins

FANS • BLOWERS • UNIT HEATERS • MAKE-UP AIR UNITS • HEAVY DUTY HEAT SURFACE

nyb

SEE OUR CATALOG IN SWEET'S

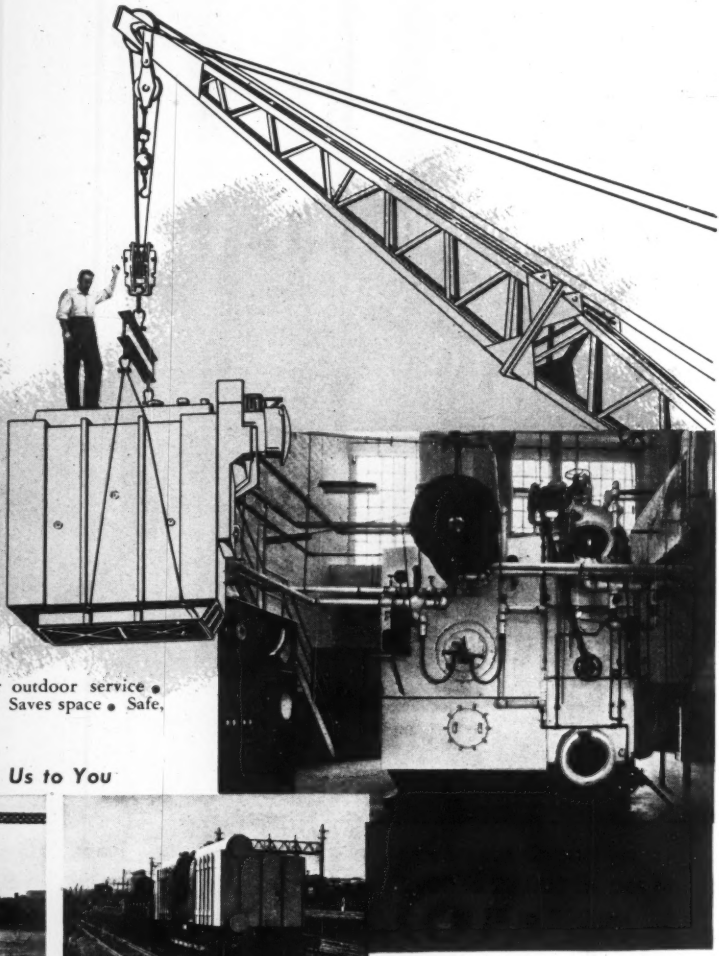
THE NEW YORK BLOWER COMPANY

SALES OFFICES • 32nd STREET and SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

IF YOU WANT TO

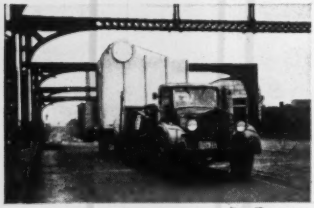
Bring Steam Costs Down



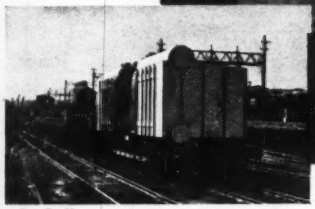
CONSIDER THIS
Factory-assembled, Self-contained B&W Integral-Furnace Boiler, Type FM

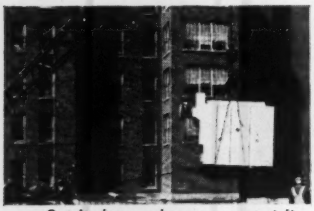
• Saves erection time and cost • Meets wide range of services • Handles quick load changes • Fast steaming • Low maintenance • Easy accessibility • Suitable for outdoor service • Burns oil and or gas • Saves fuel • Saves space • Safe, automatic operation.

It Is Easily Shipped from Us to You

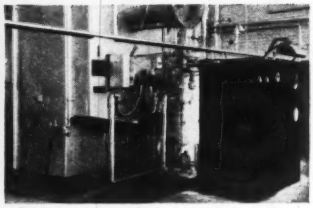


By Truck . . By Rail





Set it down where you want it . . . Set it up in a hurry



There's no law against buying more than one FM unit if you need BIG BOILER capacity. Many companies have, and pocketed the money they would otherwise have spent tearing their buildings apart to put the boiler in. Ask your nearest B&W man to explain the economical service you can expect from Type FM boilers . . . or send for Bulletin G-72.

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION
161 East 42nd Street, New York 18, N. Y.

B&W **BABCOCK & WILCOX**

G-564

THE EDITOR'S PAGES

A "MAJOR INSPIRATION" in the development of a new cigarette was a bank installation of air conditioning, according to its manufacturer.

Because of the bank experience, the tobacco company conducted experiments leading to the perfection of a process using triethylene glycol, which is used in air conditioning as a germ killer, as a moistening agent for cigarettes.

According to the newspaper advertisements for another new cigarette, its filter tips were a development of the air filters used in handling radioactive materials in connection with atomic energy work.

Thus, air conditioning affects our daily lives more and more as time goes on. When will someone write an advertisement for cigarettes proving they will cool the air in your house, dehumidify it in summer, humidify it in winter and in general promote our complete year 'round comfort, health and well-being?

DEVELOPS STANDARD FOR RING JOINT GASKETS

CONFUSION AND duplication of ring sizes for ring joint gaskets and grooves for steel pipe flanges has been brought under control by a committee organized under the procedure of the American Standards Association and jointly sponsored by the Heating, Piping and Air Conditioning Contractors National Association, the Manufacturers Standardization Society of the Valve and Fittings Industry, and the American Society of Mechanical Engineers. This committee has established an American Standard correlating these sizes which has been approved by the ASA.

The new standard (ASA B16.20-1952) was prepared by cooperation between ASA committee B16, on pipe flanges and fittings, and the American Petroleum Institute, and incorporates the specifications of several API standards.

Most important, the new standard provides an authoritative source of information for the size designation of rings. Each of the existing 92 rings has its own designation and if a need for new rings should arise, these rings can be assigned additional numbers to be recorded in the next revision of the standard.

Copies of the standard are available from the American Standards Association, 70 E. 45th St., New York 17, N.Y., for $1.

STEEL BOILER MANUFACTURERS MEET

SIXTY-FIVE MANUFACTURERS of steel boilers, heating accessories and allied products attended the annual meeting of the Steel Boiler Institute.

Four new directors were chosen: Paul K. Addams, president, Fitzgibbons Boiler Co., Inc.; Paul M. Fleming, vice president, The Bigelow Co.; Elbert M. Palmer, vice president of Kewanee Boiler; and Howard B. Steggall, vice president, Pacific Steel Boiler Div. of U. S. Radiator Corp.

Officers of the Steel Boiler Institute are R. A. Locke, president and A. P. Weiss, vice president (vice president and secretary, Burnham Corp.).

Mr. Locke reported on the volume of business in the steel boiler industry for 1952 up to April 27. During this period, shipments amounted to 93 percent of the shipments for the similar period of 1950 and 62 percent of the shipments for the similar period of 1951. During the month of April, he said, the shipments picked up in comparison with 1950 and 1951 and amounted to 78 percent of the 1950 shipments and 77½ percent of the 1951 shipments for the similar periods.

SEE NO RELIEF FOR NICKEL IN STAINLESS

REVISION OF prohibitions on the use of nickel is not even "remotely possible," members of the Stainless Steel Industry Advisory Committee were told May 27 by officials of the National Production Authority.

On the contrary, NPA said, there is a need for more stringent restrictions on the use of nickel bearing stainless steels because of the continuing scarcity of nickel.

Prohibitions on the use of nickel in stainless steel production are contained in NPA Order M-80.

NPA reported the supply situation on chromium continues practically as it has for six months. High carbon ferro chromium and chromium metal were reported in good supply, and low carbon ferro chromium production in close balance with industrial requirements and consumption.

Availability of low carbon ferro chromium will improve in the next two or three months, NPA said. New facilities, NPA said, may permit an expansion in non-nickel bearing stainless steel production.

IBR ELECTS, HEARS REPORTS, IS OPTIMISTIC

WESLEY J. PEOPLES, president and chairman of the board of the United States Radiator Corp., was elected chairman of the Institute of Boiler and Radiator Manufacturers at the IBR's 37th annual meeting. Robert S. Waters, president of the National Radiator Co., was elected vice chairman, and R. E. Ferry, general manager of the institute, was re-elected treasurer.

Ninety-five members, associate members and international members attended the meeting and expressed general optimism on business conditions. It was the consensus that with the re-establishment of a seasonal pattern of sales, the volume of business in 1952 would equal or exceed that of 1951.

In contrast to 1951, when sales during the first quarter were exceptionally heavy, business during 1952 is tending to approach the normal

"QUOTE"

"The most important single factor in our national economy in the last 100 years has been the rise of engineering. During those 100 years, engineers have applied scientific discoveries to the problem of giving us an abundant life in peacetime and the means of protecting our country in times of war.

"I believe that it is no mystery why America has advanced into world leadership."—*Charles L. McCuen, Vice President and General Manager, General Motors Research Laboratories, at the Michigan State College engineering exposition.*

pattern in which approximately 30 percent of heating products are sold during the first half of the year and 70 percent during the last six months, says the IBR.

This upward trend was also reflected in Mr. Ferry's statistical analysis of the industry based on a study of the sales of low pressure heating boilers. Mr. Ferry said that in 1951 a total of 316,000 low pressure cast iron and steel boilers were sold as compared with 246,000 in 1949.

Members of the institute approved the publication of a new IBR testing and rating code for indirect water heaters of the external type.

It was announced at the meeting that 10 companies have published IBR ratings on baseboards. In addition, a substantial number of manufacturers stated that they would within three months apply for ratings on fin tube radiation and baseboards.

Francis E. McArdle, chief of the heating branch of the building materials division of the National Production Authority, told the institute that it may be that the present restrictions on the use of steel and aluminum for heating equipment will be eased by January 1, 1953. The outlook for increased allotments of copper and nickel bearing stainless steel is not good in the foreseeable future, he said.

In reporting on the research program, Warren Harris, research professor at the University of Illinois, said that the IBR research program for the 1951-1952 heating season consisted of two major projects. First was an investigation on the performance of floor panel heating systems. Second was a study of the heating effect of radiators, convectors and baseboards under actual use conditions.

Floor panel heating was installed in each of the four test rooms. Three methods of applying floor insulation were used. In room "A", the edge and entire under surface of the concrete floor were insulated. In room "B", the insulation was placed along the inside edge of the foundation wall and extended from the top surface of the concrete slab floor down to a depth of 18 in. In the other two rooms the insulation was placed vertically between the floor slab and foundation on the exposed walls and horizontally under the floor for a distance of 2 ft.

The university found that insulating the entire underside of the slab reduced the heat flow into the ground by approximately 3 percent and made a corresponding increase in the rate of heat flow into the room. There was little or no difference in the effectiveness of the two types of edge insulation used.

It was also found that a panel system has the desirable characteristic of automatically increasing the heat output rates near the points of high heat loss of the room such as at exposed windows and doors.

As originally set up, the investigation of heating effect was to run for two years and representative radiators, convectors and baseboards were to be included in the tests.

All units were to be tested while operating under usage conditions in connection with a forced circulation hot water system designed for a maximum operating temperature of 215 F. To date tests have been completed on three of the six units to be included in the complete program.

"While the program is only half completed," said Professor Harris, "the results we have obtained thus far seem to demonstrate that 'heating effect' is more a function of the way the equipment is used than it is a function of the design of the equipment. This being the case it would not seem that 'heating effect' allowances should be made to cataloged output ratings of a particular piece of equipment.

"By continuing this program through the next heating season, we should obtain information necessary to show whether or not 'heating effect' allowances are justified for actual usage conditions," he declared.

REPORTS ON AIR CONDITIONING EARNINGS

NET PROFIT OF the Carrier Corp., pioneer air conditioning firm, for the 12 months ended April 30, 1952 was $3,900,079 or $1.26 per common share, as compared with $4,470,360 or $1.90 per common share for the preceding similar period. The 1951 figures have been adjusted to reflect retroactive increases in income tax rates. Earnings per share in both periods are based on the number of shares presently outstanding.

Before income and excess profits taxes, earnings were $10,932,750 during the 12 months ended April 30, 1952. The comparable figure for the corresponding period a year earlier was $10,576,360. Taxes on income amounted to $8.12 per common share in the 12 months ended April 30, 1952 versus $7.05 in the prior 12 months.

During the period under review, completed sales totaled $85,044,351 and new orders were booked in the amount of $74,973,152. The comparable figures for the 12 months ended April 30, 1951 were $76,586,570 and $87,888,077 respectively. On April 30th last, the corporation had a backlog of unfilled orders "of the normal type" amounting to $34,779,128 as compared to $44,134,022 a year earlier.

The above bookings and backlog figures are exclusive of the unshipped portion of government contracts for equipment unrelated to Carrier's normal production, which totaled more than $50 million on April 30, 1952.

Commenting on the operations of the corporation, Cloud Wampler, Carrier president, said, "During the 12 months ended April 30, 1951 both completed sales and net profits were the highest in Carrier's history. This reflected stepped-up demand following the outbreak in Korea. In the 12 months ended April 30, 1952 new high records were established with respect to completed sales and earnings before income and excess profits taxes. But net earnings declined due to substantially higher tax rates. Since the beginning of our current fiscal year on November 1, 1951 new orders have been booked at a rate somewhat lower than a year earlier, but in excess of the volume budgeted."

PUBLISHES ABSTRACTS ON HEATING, VENTILATION

THE NATIONAL College for Heating, Ventilating, Refrigeration and Fan Engineering, which is part of the Borough Polytechnic, Borough Road, London S.E. 1, England, has commenced the publication of sets of abstracts of published literature in heating, ventilating, etc. The Bulletin, as it is called, will be published every two months and can be obtained from the librarian of the college for $2.50, which includes postage (six issues).

To keep up-to-date on new and improved equipment, read the Equipment Developments and Recent Trade Literature departments, which are published regularly in HPAC.

BACKING YOU UP ON THE BIG JOBS...

[AND THE LITTLE ONES, TOO!]

In modern Brunner engineering laboratories, trained refrigeration engineers conduct the never-ending search for "ways to make it better"...

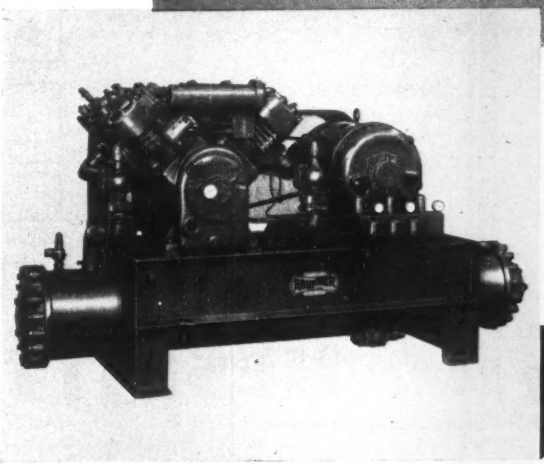
When you sell and install Brunner air conditioning—you have two very distinct advantages to back up your efforts.

First, you have the finest refrigeration and air conditioning units—engineered for years of trouble-free service and top performance. That means less maintenance, bigger profits for you—and lower costs, more satisfaction for your customers.

Second, you have the full assistance of highly skilled Brunner application engineers—ready, willing and able to give you the expert advice that wins contracts and keeps customers sold after the job is installed.

Hundreds of contractors know what this two-way Brunner backing means to them in dollars and cents. We'd like you to know, too... why not see your Brunner representative—or write us now! Dept. L-7.

BRUNNER MANUFACTURING CO., UTICA 1, NEW YORK, U.S.A.



For every air conditioning or refrigeration need . . . Brunner condensing units from ¼ HP to 100 HP—69 air and water cooled models.

Self-contained Brunner Packaged air conditioning units up to 10 HP.

YOU CAN'T BEAT

BRUNNER

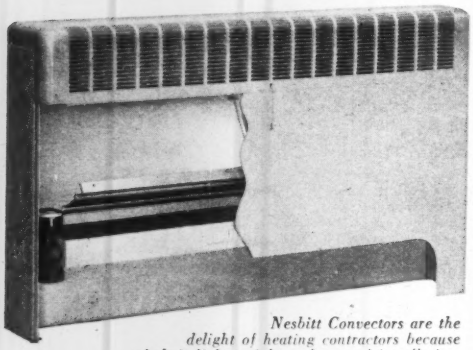
SINCE 1906

AIR CONDITIONING AND REFRIGERATION

How many of these *advantages* do you get in the *convectors* YOU buy?

Model U Convectors provide clean, uniform heat as well as comfortable radiation.

You get all these in **NESBITT** Model U Convectors



Nesbitt Convectors are the delight of heating contractors because of their light weight and ease of installation.

Scientific design: an *engineered* product resulting from 40 years of Nesbitt *pionairing* in the comfort heating field. ☐

Superior construction: of heavier than customary furniture steel; sturdily reinforced; built up to a reputation, not down to a price. ☐

Artistic styling: conformable to the best décor; rounded edges; functional curved-top grille for added heating capacity. ☐

Pleasing finish: phosphated metal, hardcoated in a neutral prime gray that takes a color coat well, but does not require it. ☐

Universal application: to one or two-pipe hot water systems (forced or gravity), or to two-pipe steam systems. ☐

Optional placement: the one casing may be installed free-standing or semi-recessed, as desired, with front easily removable. ☐

Easy connection: with universal headers tapped for every practicable hookup without removal of element from casing. ☐

Stock sizes: modular lengths in two heights, offering 23 standard sizes—from wholesaler stock—for practically every requirement. ☐

Honest ratings: in generous conformance with Commercial Standard 140-47 and approved by the Convector Rating Committee. ☐

Individual packing: fully assembled in a durable corrugated carton for delivery to the job in mint condition. ☐

Dampers optional: in complete separate packages, with all attachments, for easy installation, originally or later. ☐

Competitive prices: with the savings of large-volume, production-line manufacture passed on to you. ☐

Reliable guarantee: against original defects in material or workmanship, for one year from date of shipment. ☐

Order Convectors *by name:* NESBITT

Sold exclusively through Plumbing and Heating Wholesalers

A product of JOHN J. NESBITT, INC., State Road and Rhawn Street, Philadelphia 36, Penna.

"OPEN FOR DISCUSSION"

We follow here each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to participate. Address your comments to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

SOLVING OIL BURNER INSTALLATION PROBLEMS

KALMAN STEINER'S article on unusual fireboxes for solving oil burner installation problems (in the June HPAC) proves to be not only interesting reading, but a compilation of ingenious ideas.

We have experienced the same difficulties that Mr. Steiner describes in his article and have arrived at similar solutions.

The "steel boat" method he described has been used to some extent in the Chicago area in installations close to Lake Michigan. Many of the buildings occupying sites adjacent to the lake front are built upon land reclaimed from the lake. The soil consists of refuse and cinder fill and is comparatively porous. Excavations for pits made in this area entail severe water problems because of this porosity. A possible solution to this problem would be the installation of drain tile draining into a sump in which a heavy duty sump pump would be mounted. This method depends for its success upon the continuous operation of the pump and a pump failure would create an immediate emergency. The steel boat method offers a permanent solution to this difficulty without relying upon the operation of any pumping equipment.

We have found it advantageous to weld an angle iron approximately 4 in. from the top of the pan, having a 3 in. lip to insure a tight seal of the concrete. It might also be well to allow approximately a ¼ in. space between the pan and the concrete above this angle iron and pour a mastic into this opening to provide for expansion.

We have encountered the problem of firing wood refuse and oil or gas alternately when wood refuse is not available. If the wood refuse is shavings or sawdust, no difficulty is encountered — but if the wood refuse consists of larger pieces, a hog is often employed to grind the refuse into smaller particles. A screw conveyor and a blower fan introduce the refuse similarly to the introduction of pulverized coal. With this arrangement, either fuels can be fired in the same combustion chamber. With this method there is no necessity for two combustion chambers. It is true, however, that a hog is an expensive type of equipment, and Mr. Steiner's method obviates the need for this costly unit.—FRED MEYER, Mid-West Heat Service.

USING WELL WATER FOR AIR CONDITIONING

FOLLOWING PUBLICATION of the article by A. I. McFarlan on improving the use of well water for air conditioning, in the May HPAC, comments on some of the points he mentioned were referred to the author. Mr. McFarlan has replied to them as follows; the comments themselves are not given here, as his reply is self-explanatory.—THE EDITORS.

REPLY BY THE AUTHOR — On page 258 of the 1952 ASHVE Guide, there is a table of typical commercial design room conditions for summer average peak load in comfort air conditioning. For "normal applications," the dry bulb temperature is given as 80 F, the wet bulb temperature as 67 F and the relative humidity 51 percent. The explanation of the table at the bottom of the page says that "deluxe figures would also apply in general for localities having a summer outdoor design temperature of 90 F or less." Since the reference in my article was to 95 F outside design conditions, it would appear to me that my statement referring to 80 F and 50 percent as ASHVE design conditions is accurate. Certainly this is the most common design condition in the New York area.

In reference to the increased depth of the coil, this question generally produces a surprising result among engineers who are in the habit of using a 10 to 12 F rise through the coil. It is not uncommon to have a 10 to 12 F temperature difference at the leaving side of the coil; yet few people design the coil for a 10 to 12 F temperature difference on the inlet side of the coil. This can be accomplished with a relatively small addition in coil surface — usually not more than two rows — if a coil is circuited in such a way as to keep the water velocity at 4 to 5 ft per sec.

In reference to the additional load on the fan motor, it is not uncommon to have a one or two row heating coil in addition to the cooling coil, carrying the load of both coils unnecessarily for the entire year. With the addition of one or two rows to the cooling coil for the arrangement proposed in my article, the result is comparable to the heating and cooling coils in series. In the exceptional case where the fan resistance is increased, the penalty is very slight compared with a saving of 50 to 80 percent of the compressor horsepower.

As to combining the heating and cooling, I did not mean to imply that the same coil can handle both the interior and perimeter spaces of a building. This, of course, is an impossibility in winter. Where interior and peripheral areas are both being cooled, the same air stream usually can be used. There are exceptions, however — especially in densely populated interior areas.

For the in-between seasons and the heating season, this type of load frequently requires cooling for the interior areas and heating for the peripheral area. We have found that, in general (and again there are exceptions), where 25 percent outside air is used, there is sufficient refrigeration effect from the mix air to satisfy the interior cooling requirement. It is, therefore, only necessary to boost the temperature of the mix sufficiently above the desired room temperature in the peripheral area to maintain the desired room temperature. Again, attention is called to the fact that in the New York locality, supplementary radiation is usually required in offices to prevent downdrafts under the windows and as a source of radiation to overcome the

body loss to cold glass and cold walls.

Where sufficient air is available for a cooling job in the summer, the heating can generally be accomplished at a temperature a few degrees above the room temperature, especially where supplementary radiation is used in the manner described above.

In addition to the cooling of the inside area and the heating of the peripheral area, there is still another condition sometimes met where one area will require mix air to be heated to a temperature below the room temperature, for cooling, and another area will require the mix air to be heated above the room temperature, for heating. This can be accomplished by a thermostat in the air leaving the main heating-cooling coil controlled from the area requiring cooling and a separate thermostat in the peripheral area, resetting the air from a booster coil to satisfy the area requiring heat.

In other words, one air conditioning unit with a booster coil can usually supply two or more zones where heating and cooling are required simultaneously.

We have found it is desirable where supplementary radiation is used, that a deficiency of heat always should be supplied by the radiation, and the final increment of control be from the air stream. This has given excellent results and very accurate control. Also, as brought out above, even for peak winter loads the air temperature usually is less than 10 F higher than the room temperature for the peripheral areas, so that accurate modulation is possible. We definitely control the supply temperature, generally from an outside thermostat, and we control the room temperature from room or zone thermostats which regulate the quantity of air supplied in such a way as to keep the outlet velocity constant. — A. I. McFarlan, President, A. I. McFarlan Co., Inc., Air Conditioning Contractors.

DRILLING AIR INTAKES FOR CONDITIONING UNITS

A machine for drilling air intakes for the room air conditioning units installed in the South Texas building, San Antonio, was described and illustrated (photos and sketches) in an article by Will D. Sampson published in the July 1951 HPAC. Recently, more information about this machine was requested, and Mr. Sampson has prepared the following additional comments in reply.

The drilling machine has found several uses since the air conditioning system was completed for which it was originally designed. At the time, a rundown on patents was made and the device is now in the patent pending stage.

Several months ago we were called upon to drill holes through a concrete transformer vault that was being expanded. These holes were for new conduit and had to be accurately placed. Since there was no ledge to hang onto, as with windows in our original problem, we shot bolts into the wall and fastened the entire rig to these. The set-up time was somewhat longer but the actual drilling was but a matter of minutes. The overall costs were a great deal less, for the holes were in precision position, absolutely smooth, and no patching was necessary.

When we were working on the South Texas building — the original project — we ran into a great deal of steel or iron work. This came about by the fact that the top four floors were an addition and at the point of addition an ornamental iron railing or banister that had run around the entire building had been left in place and cast into an inverted beam. We drilled some 20-odd holes on this floor and in each case struck one of the balusters, which was a 1 in. square, twisted wrought iron bar. The first one cut, of course, caused a great disturbance in our minds — fearing we had cut structural steel.

At the time there was no indication in drilling rate, vibration or noise. The bar was cut unknowingly until the bit was removed. The mad scramble for old plans and the excitement until the railing was discovered can well be understood.

The cutters are of carboloy steel in a form almost duplicate to a high speed lathe bit. The design is similar to a left cut, left offset bit with slightly more end and side relief, back and side rake angle practically the same.

Four of the bits are set into the barrel for holes up to 7 in. The barrel is of extra heavy steel pipe the diameter and length of the hole required. The barrel is powered from a standard 6 in. pipe threading mule. This, therefore, drills a cored hole removing as little material as is necessary to clear the inside and outside of the barrel. By the use of an industrial type vacuum cleaner, we collect the drill dust. But this is not the real purpose of the vacuum; it is used to clear the dust and chips from the cutting bits.

These bits, as well as the head of the barrel, are removable. We made, in the first case, two heads and two sets of cutters in order to use one while resharpening the other. We found, however, that we could cut 40 to 50 holes without sharpening and sharpening could have been done after working hours. On the floor with the wrought iron, all holes were drilled at one time and the bits then resharpened.

At the moment, we are developing designs for a manufacturer on a "hush-hush" operation to core a 12 in. hole through 7 in. of concrete, secondary tile, back-up brick and face terra cotta. The total depth of cut is 17 in. This barrel has eight cutting bits and a built-up sample section of this wall has been drilled in 27 minutes. The total cost of the machine, labor, etc., is less than a third the cost of doing the same operation manually.—Will D. Sampson, Will D. Sampson & Associates, Consulting Mechanical Engineers.

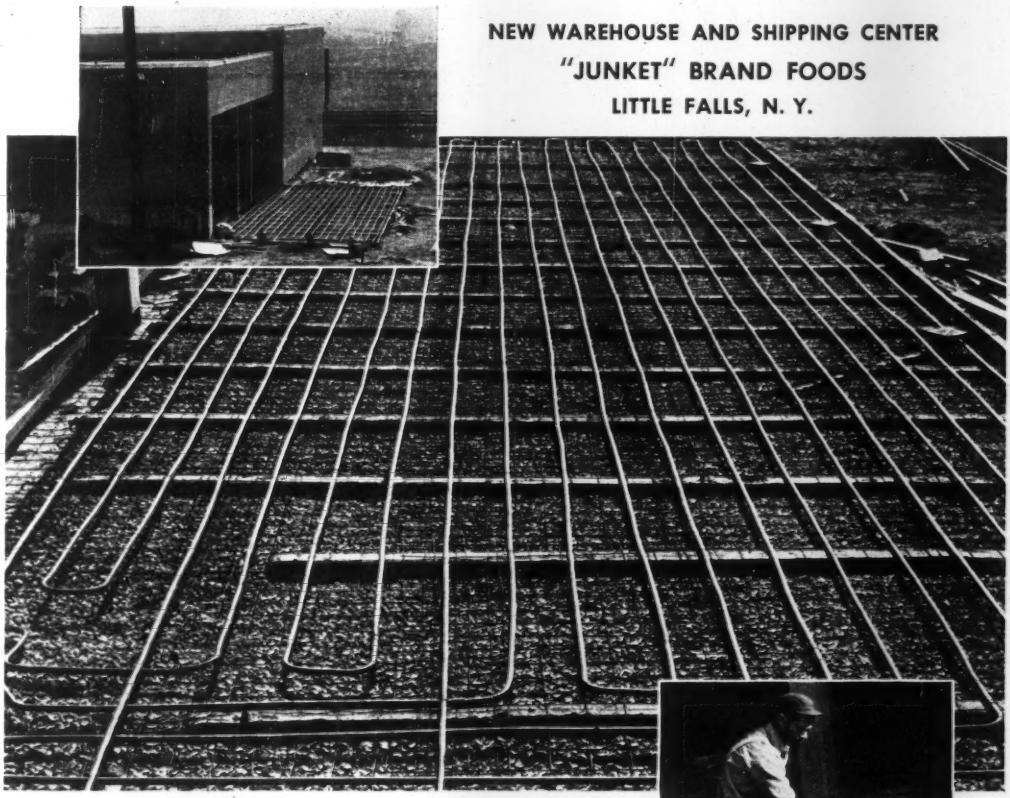
WARM AIR SUPPLEMENTS RADIANT SYSTEM IN SCHOOL

Use of radiant heating systems in school buildings raises a problem of air circulation that has been solved in a number of ways. A typical solution is that employed in the design of the new elementary school at New Lexington, Ohio.

The radiant heating system consists of wrought iron coils embedded in the floor of the one-story structure. It is designed to operate at a constant temperature of 65 deg throughout the school year, being turned off only during the summer recess. The difference between this temperature and the desired room temperature of 72 deg is supplied by a forced warm air system, which also circulates air.

The school has 11 classrooms. Each pair of classrooms has a switch which is turned on in the morning by one of the teachers, starting the warm air fans in motion.

NEW WAREHOUSE AND SHIPPING CENTER
"JUNKET" BRAND FOODS
LITTLE FALLS, N. Y.



GUIDE PLANK is used by workman to facilitate installation of 1" Type K soft temper Revere Copper Water Tube. Revere Tube also comes in hard and soft tempers in straight lengths of 20 ft.

LARGE PHOTO ABOVE shows Revere Copper Water Tube in place ready for pouring concrete.

ANOTHER CASE OF *Copper* WHERE IT COUNTS!

During the winter months there will be no snow or ice troubles at the truck entrance of the new "Junket" Brand Foods Warehouse. A snow-melting system of Revere Copper Water Tube in the 20′ x 60′ concrete slab sees to that. This building, erected prior to the copper shortage, was designed by Architects, Bagg and Newkirk. Heating Contractor was H. J. Brandeles Corp. Revere Copper Water Tube was supplied by the Crane Co., all of Utica, N. Y.

The contractor found the light-weight, 60′ length coils of Revere Copper Water Tube easy to handle and install. Also, its soft temper permitted bending, reducing the number of fittings used. Other features that architects, contractors and builders like about Revere Copper Water Tube are: Because it is non-rusting it will last indefinitely . . . the solder or compression fittings used make it possible to use a thinner wall tube than is possible when threaded fittings are used, with a substantial saving in metal.

Next time you build, plan, specify or make an installation, make sure Revere Copper is used in the spots where enduring performance counts most. The architects, contractors and builders who do have found that it pays dividends in prestige, reputation and customer satisfaction.

See your Revere Distributor. He will advise you of the availability of materials and, in the event you wish to discuss your technical problems, put you in touch with Revere's Technical Advisory Service.

REVERE

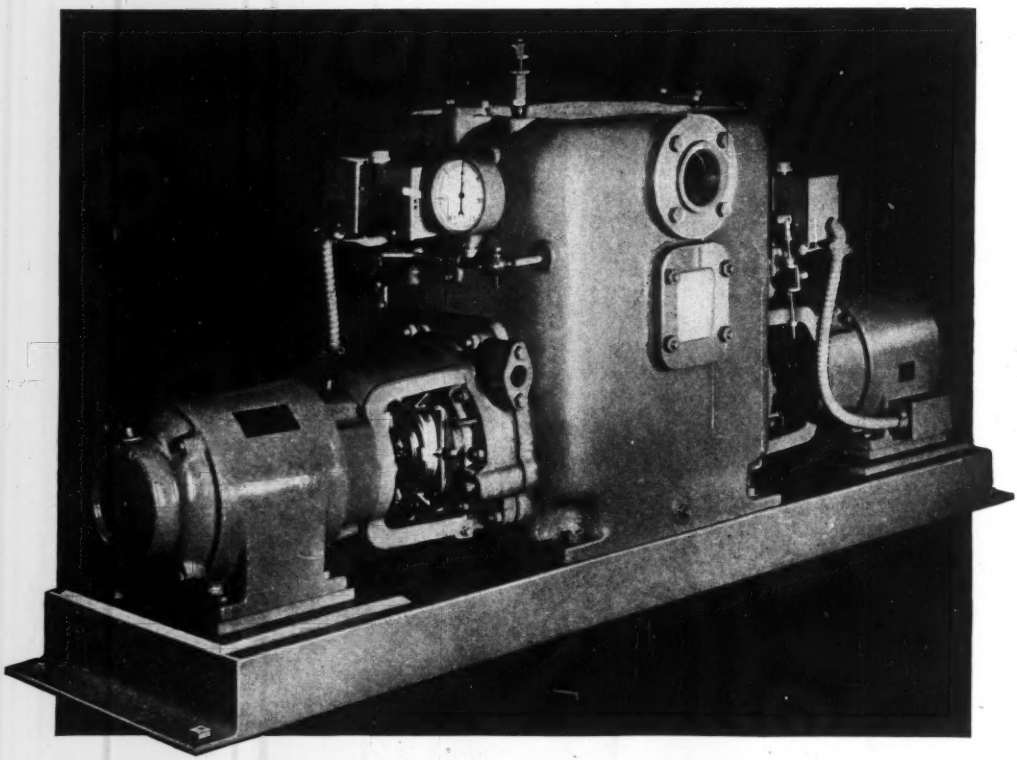
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



THE HEATING PUMP WITH CERTIFIED PERFORMANCE

A Jennings Return Line Vacuum Heating Pump may be installed with the absolute assurance that it is of the proper capacity to keep your heating system at top-notch efficiency.

For the actual working capacity of your Jennings Pump is determined by careful tests under working conditions, and with the actual motor that goes on your job, regardless of current characteristics. Every Jennings Pump has to deliver full rated capacity of air and water simultaneously before it is released.

The Jennings Heating Pump has everything in the way of safety, convenience, and real dollar saving economy that years of experience as leading heating pump manufacturers have enabled us to put into it. Quality is backed by an unchallenged reputation, and satisfactory performance is assured by a nation-wide network of Sales and Service offices.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

ILLINOIS OHIO NEW YORK TEXAS PENNSYLVANIA CALIFORNIA TENNESSEE KANSAS GEORGIA

Air Conditioning Aiding Choice of Next President

How International Amphitheatre Was Air Conditioned for This Month's Political Conventions Is Explained

By Maurice E. Fine

THE OFFER TO provide air conditioning was the strongest selling point leading to the decision to hold the Republican and Democratic national conventions at Chicago's International Amphitheatre this month. The structure, in the Chicago Union Stock Yard, is one of the most fully equipped convention and exposition buildings in the country, combining 255,000 sq ft of exhibit space, a pavilion capable of seating 12,000 people, large assembly and meeting rooms, restaurant facilities, privately owned and lighted parking space for 4000 cars — and the new $500,000 air conditioning installation.

Scene of the previous International Heating, Ventilating and Air Conditioning Expositions that have been held in Chicago, it is the location for the eleventh of these industry affairs next January. But this month, it's the place where the next President of the United States will be nominated.

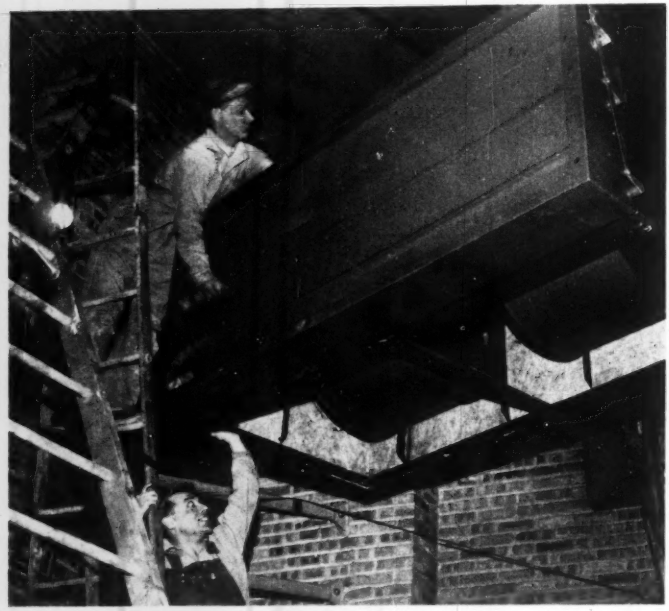
The task of air conditioning this tremendous, shell-like structure had to be tackled with the utmost speed, as designs had to be completed, bids received and contracts awarded without delay in order to meet the convention dates. It was a repeat performance for the same engineering firm which performed the feat of designing, constructing and completing the Amphitheatre within a six-month period some 18 years ago when the original building — the old Dexter Pavilion — was destroyed in the big Stock Yard fire. At that time the need for speed was an impending International Livestock Exposition, which attracted over 1 million visitors.

NEW SUPPLY DUCTS were installed adjacent to the steel arches high above the main arena's floor. The sheet metal men worked from suspended platforms, wondered if they didn't deserve some "flight pay." Photo was taken during a machine tool show before new system was in operation, so there is a smoke haze in the air

The Amphitheatre consists of a central pavilion of steel construction, 200 ft wide by 310 ft deep, flanked on the north and south by two-story exhibit wings of reinforced concrete construction. The arena in the central pavilion has an unobstructed floor area of nearly 30,000 sq ft, measuring 123 ft wide by 238 ft long.

Mr. Fine is Mechanical Engineer, A. Epstein and Sons, Inc., Engineers and Architects.

NEW COOLING COILS were installed in the four existing fan rooms. Capacity of the existing fan systems was increased from 180,000 cfm to 240,000 cfm by increasing the speed of the fans, 40 hp motors replacing the original 25 hp motors



AN ADDITIONAL 40,000 CFM is handled by four suspended type air conditioning units, making a total of 280,000 cfm of air circulated

The arches spanning the 200 ft width are 15 ft high at the haunch and 80 ft high at the peak, and spaced on 21 ft centers. The roof is of precast cement tile carried on steel purlins. The arches carry the balcony and part of the main floor framing.

The new air conditioning installation uses the existing fan systems which served to heat and ventilate the arena portion of the building. Four built-up fan systems — comprising cast iron heating sections, outside air intakes, return grilles, manual outdoor air and return air dampers — were located in the four corners of the arena, at the roof. These systems supplied air through ducts located above the trusses at the haunch, with supply outlets located above and below the balconies on the north and south sides of the arena. Additional supply ducts were located along the third floor corridors on the east and west sides of the arena, with supply ducts extending upward to serve the balconies and supply ducts extending outward to serve the mezzanine and box seats. The air distribution duct system, which performed satisfactorily for heating and ventilating the arena, was altered considerably to provide proper distribution and circulation of the conditioned air.

Existing Fan Systems Are Utilized

The capacity of the fan systems was increased from the original 180,000 cfm to 240,000 cfm by increasing the speed of the fans. New 40 hp, variable speed, slip ring motors, together with V-belt drives, replace the original 25 hp motors. An additional 40,000 cfm is handled by four suspended type air conditioning units, making a total of 280,000 cfm circulated, equivalent to about five air changes per hour.

Two of the suspended units are under the balcony of the arena at the west end and two units are installed on the first floor ceiling in the passage to the north and south of the east entrance vestibule. Supply ducts extend from these units to the mezzanine to serve the east and west portions of the main floor. A new return duct system connects to the four suspended units. The outlets which formerly supplied air under the balconies along the north and south walls and along the east and west ends of the arena were converted into return air outlets which are connected into the return ducts.

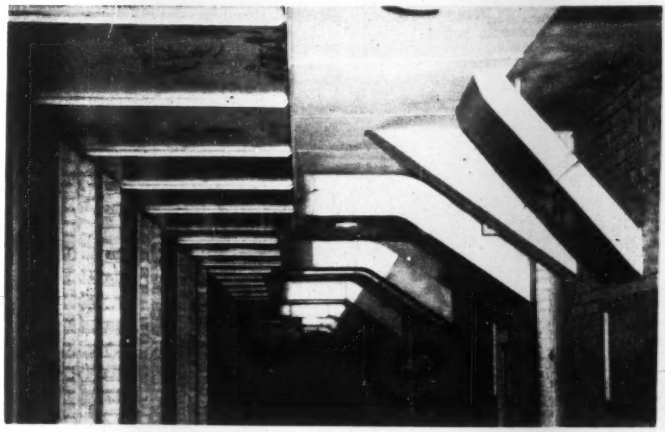
Sixteen new branch ducts extend from the supply ducts located above the trusses. These ducts run adjacent to the steel arches for a distance of approximately 60 ft, and grilles of the double deflection type distribute the air. The ducts were placed against the knee braces, which result in the ducts being at a 45 deg angle. This places the outlets in a very desirable position, since the air is discharged outward and downward to provide effective air distribution.

New Cooling Coils, Filters, Dampers

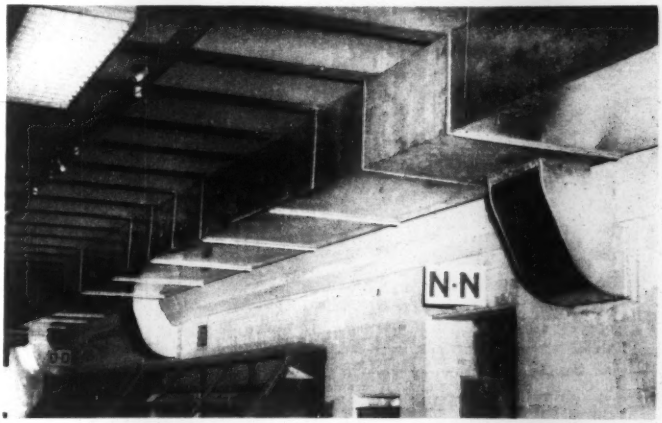
Cooling coils, drain pans, face and bypass dampers, filters and automatic minimum outdoor air dampers

(with maximum outside air dampers manually controlled and set in a closed position) were added to the existing fan systems. The apparatus casings were altered to receive the new coils, drain pans and filters. One fan system, due to space limitations, required the addition of a penthouse to receive the cooling coils and filters. The original heating coils were left undisturbed, and a double set of automatic dampers was provided to regulate the amount of air passing through the "cold deck" and the "hot deck". During the summer months, the steam is shut off manually, so that the lower deck serves to bypass the air around the cooling coils.

The cooling coils, designed for water, are six rows deep and of the continuous tube type. The area of the coils is based on a 550 fpm face velocity and the pressure drop through the water circuit was limited to 3 lb. Design of the fan system coils was based on cooling air from 84 F dry bulb and 69 F wet bulb to 55 F dry bulb and 54 F wet bulb. Coils for the suspended conditioners, which handle recirculated air only, cool air from 80 F dry bulb and 67 F wet bulb to the same final conditions. Water is supplied to the coils at 42 F and leaves at 54 F. Supply and return water connections are arranged for counterflow. Vent cocks are provided at each coil and drains are provided in the piping for each group of coils.



BRANCH DUCTS — which formerly supplied air — now return it to the booster units. This duct work in the west corridor takes air from under the west balcony



RETURN AIR DUCTS in a second floor corridor, taking return air from under the south balcony

Two Centrifugal Refrigerating Machines

The refrigeration machinery, pumps and electrical equipment are located in a new one story machinery room adjoining the north wing. There are two centrifugal refrigerating machines using "Freon-11", one with a capacity of 600 tons and the other 400 tons, driven by 600 and 400 hp, 2300 volt induction motors, respectively. The smaller machine was selected to provide refrigeration capacity for a future ice rink.

Capacity control is obtained by suction dampers which are governed by immersion aquastats in the return water line. Low limit thermostats are arranged to shut down each machine in the event the temperature of the water in the chiller falls too low. The machines are also provided with high and low pressure cut-outs, differential pressure switches actuated by the pressure drop in the chilled water circuit, and oil pressure failure cut-outs.

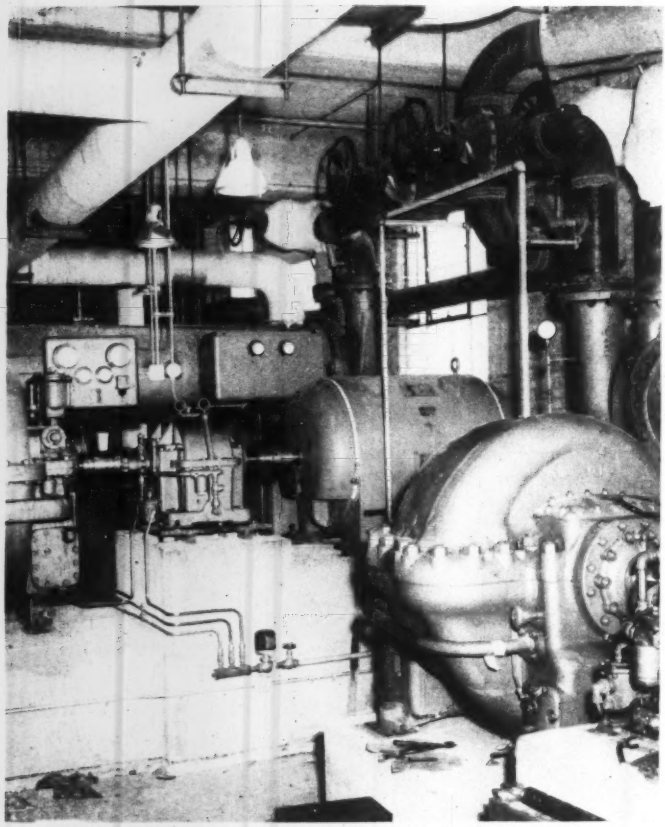
Two Long 10 In. Chilled Water Lines

Two 10 in. chilled water lines extend from the machinery room across the ceiling of the north wing a distance of approximately 200 ft to the north corridor of the pavilion, where insulated distribution lines extend to the cooling coils in the fan rooms and the suspended air conditioning units.

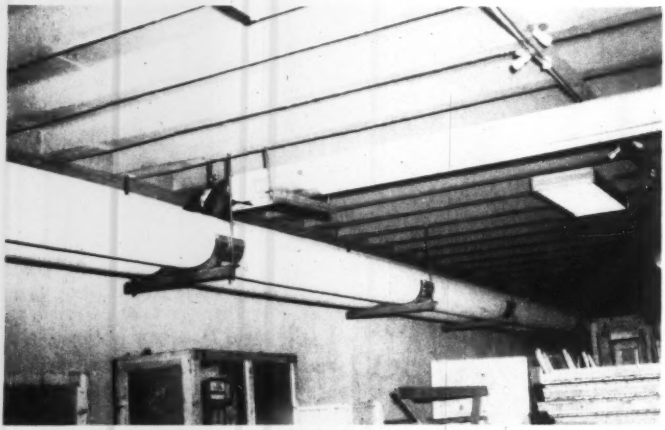
Two 1000 gpm centrifugal chilled water pumps, driven by 30 hp motors, and an 1100 gpm condenser water pump, driven by a 20 hp motor, are provided. Condenser water for the refrigeration machinery is obtained from a well water system which was extended into the building. A booster pump, located at the point where the water line enters the building, provides the required condenser water at sufficient pressure for the condensers of the refrigeration machines.

Condenser Water Discharged on Roof

Approximately 50 percent of the condenser water — after it leaves the condensers — is pumped to the roof, where a header on each side



TWO CENTRIFUGAL REFRIGERATING machines, of 600 and 400 ton capacity, are installed in a new machinery room adjoining the north wing. About half the condenser water is discharged on the Amphitheatre's roof to reduce heat gain from the sun



CHILLED WATER LINES, 10 in. in diameter, extend from the machinery room some 200 ft. From them, the chilled water is distributed to the four fan rooms and the suspended booster air conditioning units

of the monitor skylight discharges the water on the roof to reduce the solar heat gains. Excess condenser water is discharged to the sewer.

All pumps are single stage, horizontally split shell, direct connected through flexible couplings to their motors.

Controlling the Air Temperature

Air temperatures are controlled by return air thermostats which operate face and bypass dampers at the coils. Thermostats are arranged for summer-winter operation. A freeze protection thermostat is provided for each fan system to shut down the fan. Minimum outside air dampers are automatically controlled, while return air and maximum outside air dampers are manually set.

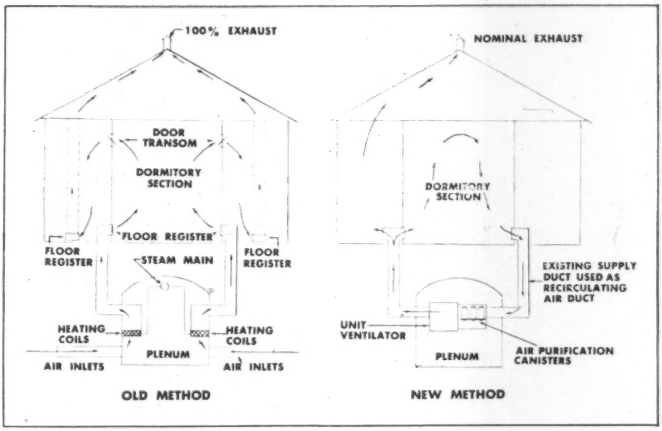
The air filters are of the permanent type, all metal, herringbone crimp, steel wire construction, cleanable by water. The filters were selected for a face velocity not exceeding 500 fpm.

Insulation of Ducts and Piping

The insulation for the chilled water lines consists of two layers of laminated wool felt, with $3/4$ in. thicknesses used for piping 3 in. and less, and 1 in. thicknesses for piping 4 in. and larger. All layers were applied with staggered joints, sealed against moisture and finished with a canvas jacket. Sheet metal shields enclosing half the circumference of the covering protect it at the pipe supports.

Supply ductwork located in unconditioned areas is covered with 1 in. corkboard applied with adhesive and, in addition, attached to the ducts with sheet metal screws and washers. The finish is rosin-sized paper and canvas jackets. Supply ducts in conditioned spaces, as well as all return ducts, are not insulated.

The International Amphitheatre is owned and operated by the Union Stock Yard & Transit Co. of Chicago. A. Epstein and Sons were the engineers and architects for the project, with Maurice E. Fine of that firm in charge of the air conditioning design and construction. William A. Pope Co. was the piping and refrigerating contractor, and Narowetz Heating & Ventilating Co. was the ventilating contractor.



THE COLDER THE WEATHER, the more outside air drawn in by the old gravity heating and ventilation system installed in 1878. In the new method, recirculated air is passed through air purification canisters to reduce ventilation air requirements and thus save fuel

Air Recovery Revamps Old Heating System

Activated Carbon Air Recovery Installation Improves Heating and Ventilation at 74 Year Old State Hospital for Mental Patients and Saves Fuel

At Pontiac State Hospital, Pontiac, Mich.—a state institution for mental patients — there are several buildings erected in 1878. These structures had, until recently, the original gravity heating and ventilating systems installed at that time. On each side of the basement were louver dampers which controlled the entry of outdoor air into large plenum chambers where it was heated by being passed over steam heated cast iron coils and thence entered ducts leading up into the rooms and corridors. From here, other ducts drew the warm air to the attic areas where it was exhausted through roof ventilators. Both heating and ventilation were regulated by opening and closing of the basement louvers. The colder the weather, the more outside air would have to be drawn in.

Although heat and ventilation were maintained fairly well by this system, a certain amount of attention and manual operation of the dampers were always necessary. Good wind conditions were essential and it was often a question on which side of the buildings to open the dampers. Moreover, the rapid passage of the warm air up through the building and out the roof ventilators, and its continuous replacement by new cold air, resulted in a high rate of heat loss and fuel consumption.

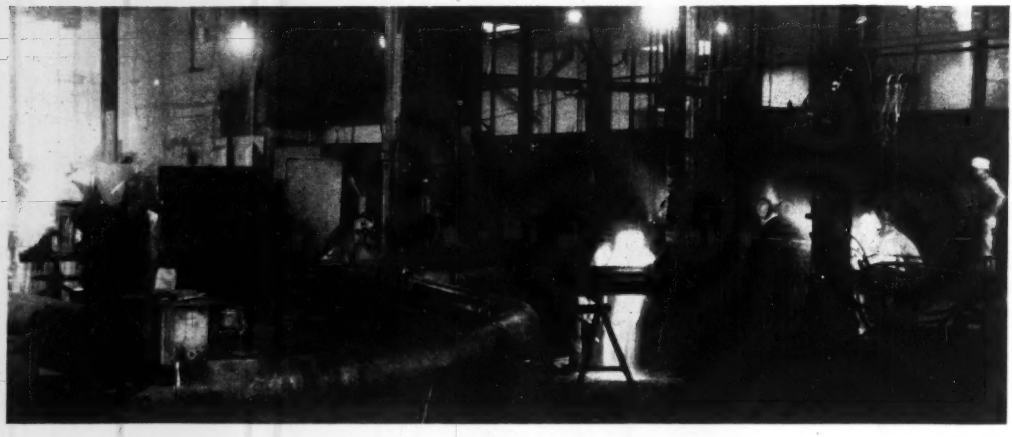
Several years ago the service section of the Building Division, Department of Administration, and the chief engineer at the hospital, decided that the old systems were not providing the proper comfort and at the same time were using too much coal. As an experiment, the coils were replaced with unit ventilators or heaters in one dormitory section and some of the supply ducts extended and linked up with the ventilators. The majority of the supply ducts were converted to return air passages leading back to the basement.

Instead of pursuing its former one-way course through the building, the air was channeled back to the basement for reheating and again circulated. This arrangement saved fuel, and for the first time provided ample and uniform heat, but it made no provision for ventilation. The normal outdoor air infiltration in a building as old as this is more than adequate for oxygen replenishment but not enough to ventilate this type of hospital where occupancy is generally high and there is considerable odor generation.

To improve the situation without adding to the heating load, activated carbon "air recovery" or purification was tried. Carbon-containing canisters were installed on the air entrance side of the basement heaters in such a way that most of the return air would have to pass through them, virtually creating a closed, continuous cycle, heating and ventilating system.

Although a large proportion of the heated air was constantly being recirculated and re-used, the atmosphere "quality" was much improved —in fact observers agreed that it was as good if not better than with the old method which supplied all new outdoor air. What was especially significant was that along with a very satisfactory heating and ventilating system, there was a substantial saving in fuel, estimated at 90 tons of coal during an average winter for this one building.

The success of the project, believed to be the first in a mental hospital to employ activated carbon, has led to similar installations in other old and new Pontiac buildings, and in a number of other state hospitals both in Michigan and elsewhere. [Sketches courtesy W. B. Connor Engineering Corp.]



Methods of Making Piping Flexibility Analyses

The Matrix Method

By J. E. Brock

Director of Research, Midwest Piping & Supply Co., Inc.

SINCE THE PROBLEM of making piping flexibility analyses is complex, the methods used for such calculations cannot be as simple as we might like and a complete exposition of any one of them would require more space than is available in a magazine article. However, the basic philosophy of a method can be explained, its advantages and disadvantages discussed, one or more examples worked out so as to indicate the volume of computation required, and reference made to more complete expositions available elsewhere.

Except for a few methods which are based on outright approximations, all of the valid methods of piping flexibility analysis are fundamentally the same — although on the surface they may appear to be quite different. Thus, at first glance the "grapho-analytical" method [1]* which makes extensive use of area-moment concepts appears to be distinctly different from the so-called "analytical" method [2] which appears to be based upon strain energy concepts. However, closer scrutiny reveals that while the point of view from which the problem is approached may be different, essentially the same arithmetic operations are called for with either method.

What Do We Ask of a Method?

We are thus led to inquire what it is that we ask of a "method" for piping flexibility analysis and in what respects a valid method may prove — in practice — to be superior or inferior to another valid method. What the method must do, of course, is to provide a means for setting up and solving a set of simultaneous linear equations for the displacements experienced by one end of the line with respect to the other, the unknown quantities being the reactions exerted upon the line by the support at its ends.

This is intrinsically simple, yet so many operations are required in the average problem that the analyst may frequently find that he has lost track of what he is doing and doesn't know what to do next (a problem of *motivation*) or has acquired so many intermediate calculations that he

*Figures in brackets refer to the bibliography.

finds it difficult to keep track of them as he goes along (a problem of *bookkeeping*).

The various valid methods differ from one another principally in the means they provide to accomplish motivation and bookkeeping efficiency. Motivation (and bookkeeping) are generally accomplished by one or both of the following schemes:

1) By setting up a list of rules to which the analyst refers and a set of forms on which he records his calculations, and

2) By creating some mechanical concept which is easy to keep in mind and the analysis of which is essentially equivalent to the analysis of the given problem. The "analytical" method [2], the tabular integration method [3], and others of this type use the first scheme. The geometric properties of the moment diagram, in the grapho-analytical method [1], the concept of the elastic center, etc., are examples of the "mechanical concept" used in the second scheme.

Besides strong, direct motivation and accurate, convenient bookkeeping, we ask also that a method combine the following features:

1) Flexibility, so that special circumstances of a particular problem may easily be taken into account and so that various degrees of approximation may be incorporated depending on time available and accuracy required.

2) Directness, so that (in effect) not too much time is spent in translating from the given problem to a possibly more strongly motivated problem and back again.

3) Possibility of checking computations at each stage with a minimum of effort.

4) Possibility of turning over the bulk of routine calculations to non-professional assistants without having to ride close herd on them.

5) Economy of operations, so that the number of arithmetic operations, transfers of data, transcriptions etc., are held at a minimum.

The author believes that the matrix method possesses advantages over most methods as regards motivation and bookkeeping. As regards the first item of the preceding list, the procedure is completely flexible; all kinds of problems can be handled with its use. It involves no alternate problem, as in Item 2. It is comparable with other methods as regards Item 3 and somewhat better than most as regards Item 4. The economy of operation, Item 5, depends upon the problem to which it is applied. The economy is overwhelming for complicated configurations but only comparable to that of other methods for simplified three dimensional systems. As the method is now set up, it is not economical of operations when applied to simple, two dimensional problems, and to use it for such problems is somewhat like cracking a walnut with a pile driver.

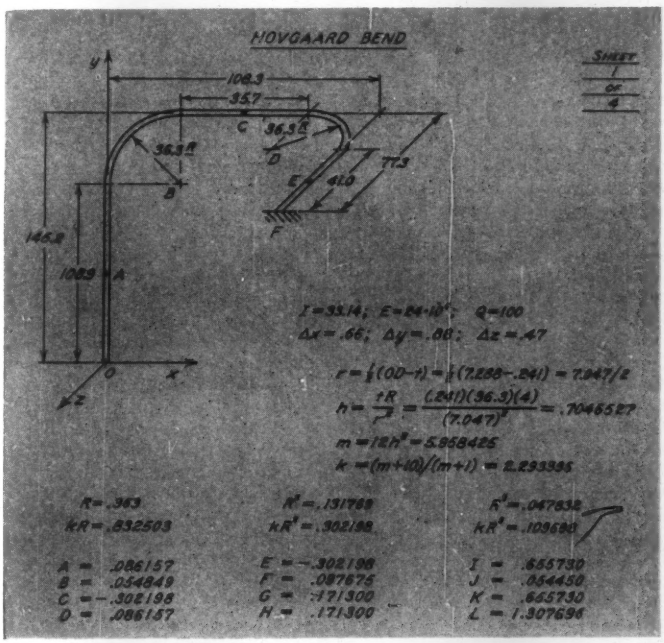
What Is Involved In Matrix Algebra

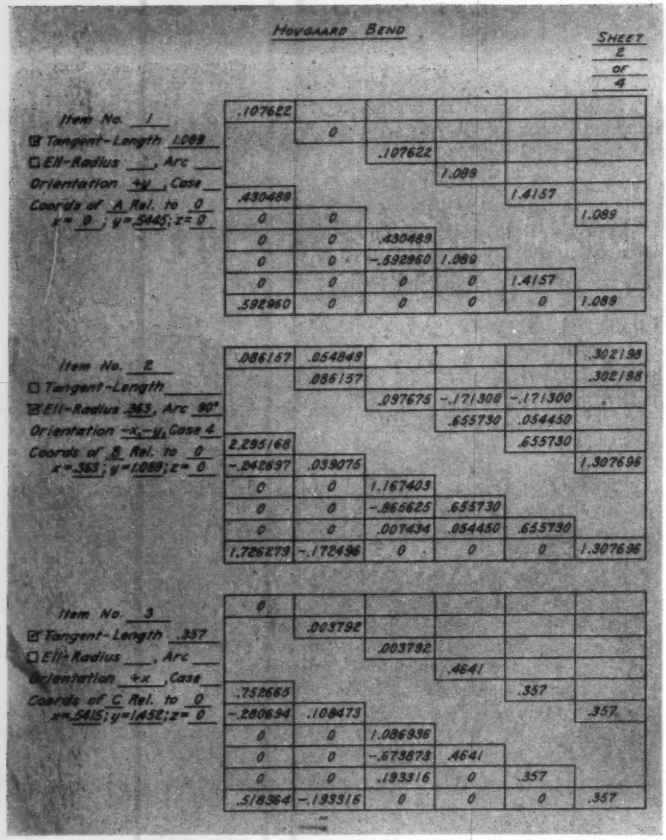
The advantages are obtained, in effect, by focusing attention on the fundamental arithmetic operations which must be performed, and strange as it may seem, obtaining very strong motivation in so doing. The method uses matrix algebra as a bookkeeping device and a source of motivation.

While most engineers are inclined to distrust other than "everyday" mathematics and the word *matrix* has an esoteric sound, all that actually is involved in matrix algebra is ordinary addition, subtraction, multiplication and division — plus some "built-in" rules for what-to-do-next and standard tabulations (these are the matrices themselves) for recording data and the results of computations. It may be remarked that modern desk type calculating machines are very well adapted to the type of calculation required — much of which might be called "accumulative multiplication."

Advantages of Using Matrices

Aside from providing the bookkeeping mechanisms for the analysis, the use of matrices provides a very powerful point of view in that it introduces single mathematical entities, with symbols and names, for describing fairly complicated physical concepts — concepts which otherwise could be dealt with mentally only in a hazy fashion or a piece at a time. Obviously having an adequate set of concepts and symbols for thinking about the problem (either qualitatively or quantitatively) is of great value in considering modifications of a design, in considering alternate routes for piping, etc. The entire method is also of value in considering modifications and supplements to other methods. The author has used it in studying improvements to the tabular integration method, which is





HOVGAARD BEND

SHEET 2 OF 4

Item No. 1
☒ Tangent-Length 1.089
☐ Ell-Radius ___, Arc ___
Orientation +y, Case ___
Coords of A Rel. to 0
x= 0 ; y=.5445; z= 0

.107622					
	0				
		.107622			
			1.089		
.430489				1.4157	
0	0				1.089
0	0	.430489			
0	0	-.592960	1.089		
0	0	0	0	1.4157	
.592960	0	0	0	0	1.089

Item No. 2
☐ Tangent-Length ___
☒ Ell-Radius .363, Arc 90°
Orientation -x,-y, Case 4
Coords of B Rel. to 0
x=.363 ; y=1.089; z= 0

.086157	.054849				.302198
	.086157				.302198
		.097675	-.171308	-.171300	
			.655730	.054450	
				.655730	
2.295168					1.307696
-.842697	.039075				
0	0	1.167403			
0	0	-.866625	.655730		
0	0	.001434	.054450	.655730	
1.726279	-.172496	0	0	0	1.307696

Item No. 3
☒ Tangent-Length .357
☐ Ell-Radius ___, Arc ___
Orientation +x, Case ___
Coords of C Rel. to 0
x=.5445; y=1.452; z= 0

0					
	.003792				
		.003792			
			.4641		
.752685				.357	
-.280694	.109473				.357
0	0	1.086936			
0	0	-.673873	.4641		
0	0	.193316	0	.357	
.518364	-.193316	0	0	0	.357

recommended as an ideal method for rapid treatment of routine two and three dimensional piping configurations without branches (a publication describing the augmented tabular integration method is in preparation.)

It is not possible here to take the space to explain the elements of matrix algebra — and without such an explanation it is not possible to delineate the method in any greater detail than is to be found above. Complete details of the method will be found in the author's papers [4], [5]. While the theory was developed independently by the author, recent opportunity to search the literature reveals that matrices have also been used by R. von Mises [6] and P. T. Hoath [7] in connection with problems of this sort.

The accompanying figures and tabulations indicate all the computations required in handling one of the two problems that have been used for illustrative purposes in the articles on methods of making piping flexibility analyses which have been published in Heating, Piping & Air Conditioning [10]. The customary Karman-Hovgaard theory for curved tubes is used so that "answers" may be compared with those obtained by others; however, the more reasonable Vigness-Beskin theory could as easily have been used [8]. In order to afford an accurate comparison with other methods of analysis, all figures are given with considerably greater precision than engineering practice warrants.

In a problem of this fairly simple nature, the matrix method affords neither an advantage nor a disadvantage. In a simpler problem, such as the two dimensional zee bend which has been used for an example in this series [10], the matrix method would appear at a disadvantage. In more complicated cases, the matrix method would prove of definite advantage. There are at present only two published examples of such cases (neither of them typical, however) — one illustrating the paper [5] and the other in connection with a discussion [9] of a paper on flat springs.

Bibliography on Piping Flexibility

[1] S. Crocker and A. McCutchan, "Elastic Properties of Straight Pipe and Bends," pp. 779-824 of "Piping Handbook" by S. Crocker, 4th ed., McGraw-Hill Book Co., Inc., New York, 1945.

[2] (*Anon.*), "Design of Piping Systems," published by The M. W. Kellogg Co., New York, 1941. Based on the Watts-Burrows-Shipman analytical method (1932).

[3] W. G. Hooper, "Methods of Making Piping Flexibility Analyses — Tabular Integration Method," Heating, Piping & Air Conditioning, Vol. 18, No. 11, Nov. 1946, pp. 70-76.

[4] J. E. Brock, "A Matrix Method for Flexibility Analysis of Piping Systems," presented at the Western Meeting of the Applied Mechanics Division of the American Society of Mechanical Engineers, Los Angeles, June 26-28, 1952. To be published in the Journal of Applied Mechanics.

[5] J. E. Brock, "Matrix Analysis of Flexible Filaments," Proc. First U. S. Nat. Congr. Appl. Mech., Chicago, June 11-16, 1951. To be published by ASME.

[6] R. von Mises, "Motorrechnung, ein neues Hilfsmittel der Mechanik," Zeit. f. Ang. Math. u. Mech., Vol. 4, (1924), pp. 155-181, and "Andwendungen der Motorrechnung," ibid., pp. 193-213. See also "Bemerkung zu dem Aufsatz von Hrn. Ferd. Schleicher uber die elastische Formanderung krummer Stabe," ibid., pp. 486-487.

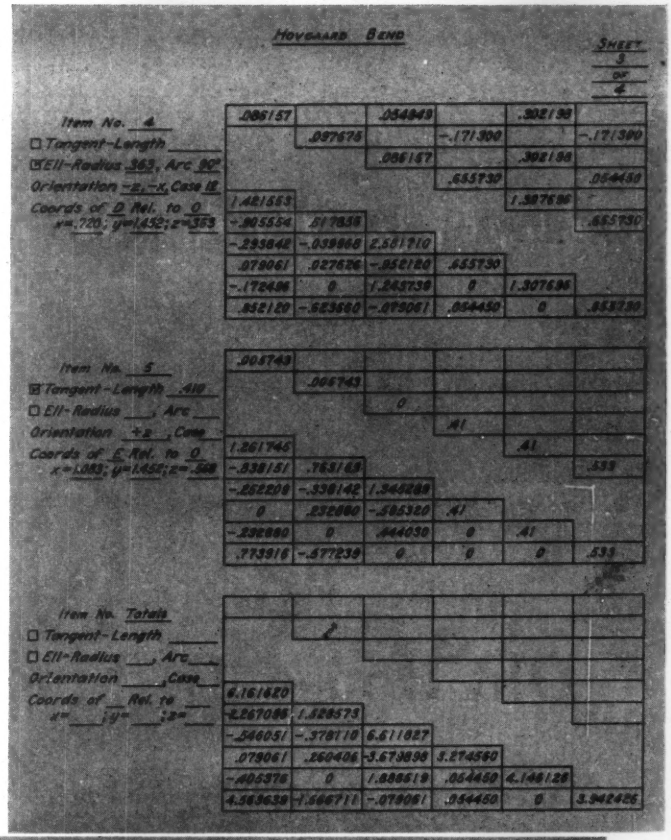
[7] P. T. Hoath, "Steam Pipework Design in Ships," Trans. Inst. Marine Engs., Vol. LIX, No. 10, 1947, pp. 189-214, discussion pp. 214-220.

[8] P. S. Symonds and I. Vigness, discussion on the paper "Bending of Thin Curved Tubes" by L. Beskin, J. Appl. Mech., Vol. 13, 1946, pp. A-66 -A-67, provides a convenient summary of results on flexibility of bends.

[9] J. E. Brock, discussion to the paper "Design of Flat Wound Tension Springs," by R. M. Conklin and

D. R. Forray. Paper and discussion to appear in the J. Appl. Mech.

[10] In the June 1946 HPAC, Sabin Crocker and Arthur McCutchan reviewed the various methods of making piping flexibility analyses and suggested that the advocates of the different schemes each briefly outline the merits of his method and show the solution of two problems so that the reader could judge for himself the suitability of the different calculation procedures in his own piping work. . . . S. W. Spielvogel followed this suggestion in the July 1946 issue, explaining the essentials of the elastic center method, and in September M. J. Fish discussed the graphical method. In November 1946, W. G. Hooper covered the tabular integration method and solved the two problems given by Messrs. Crocker and McCutchan by that means. In the January 1947 number, R. C. DeHart explained the moment distribution method; H. V. Wallstrom reviewed the general analytical method in May; and in August, Lale C. Andrews discussed a model test method. In September 1947, there was published an article by Henri Carlier, as translated by Mr. McCutchan. F. E. Wolosewick discussed the "column analogy" concept in the September 1948 Heating, Piping & Air Conditioning.



HOVGAARD BEND — SHEET 3 OF 4

Item No. 4
☐ Tangent-Length ___
☒ Ell-Radius 363, Arc 90°
Orientation −z, −x, Case III
Coords of D Rel. to O
x=.720; y=1.452; z=3.63

.086157		.054849		.302198	
	.097675		−.171300		−.171300
		.086157		.302198	
			.655730		.054450
1.421653				1.397696	
−.905554	.817838				.655730
−.293842	−.039868	2.581910			
.079061	.027626	−.852120	.655730		
−.172486	0	1.245739	0	1.307696	
.852120	−.523660	−.079061	.054450	0	.853730

Item No. 5
☒ Tangent-Length .610
☐ Ell-Radius ___, Arc ___
Orientation +z, Case ___
Coords of E Rel. to O
x=1.083; y=1.455; z=.508

.005743					
	.005743				
		0			
			.41		
1.261745				.41	
−.938151	.765169				.533
−.252208	−.338142	1.345289			
0	.232680	−.505320	.41		
−.292880	0	.444030	0	.41	
.713916	−.577239	0	0	0	.533

Item No. Totals
☐ Tangent-Length ___
☐ Ell-Radius ___, Arc ___
Orientation ___, Case ___
Coords of ___ Rel. to ___
x=___; y=___; z=___

	Σ				
6.161620					
2.267096	1.528573				
−.546051	−.378110	6.611827			
.079061	.260406	−3.673898	3.274560		
−.405376	0	1.888519	.054450	4.146126	
4.563639	−1.566711	−.079061	.054450	0	3.942426

HOVGAARD BEND — SHEET 4 OF 4

1 A-MATRIX

	1	2	3	4	5	6	Δ	Σ
1	6.161620	−2.267096	−.546051	.079061	−.405376	4.563639	.660000	8.245797
2	−2.267096	1.528573	−.378110	.260406	0	−1.566711	.880000	−1.542938
3	−.546051	−.378110	6.611827	−3.673898	1.888519	−.079061	.470000	4.287226
4	.079061	.260406	−3.673898	3.274560	.054450	.054450	0	.043029
5	−.405376	0	1.888519	.054450	4.146126	0	0	5.683719
6	4.563639	−1.566711	−.079061	.054450	0	3.942426	0	6.914743

5 CHECK OF RESULTS

	Δ	Error
1	.660001	.000001
2	.879996	−.000004
3	.469990	−.000010
4	.000003	.000003
5	−.000004	−.000004
6	.000001	.000001

2 B-MATRIX

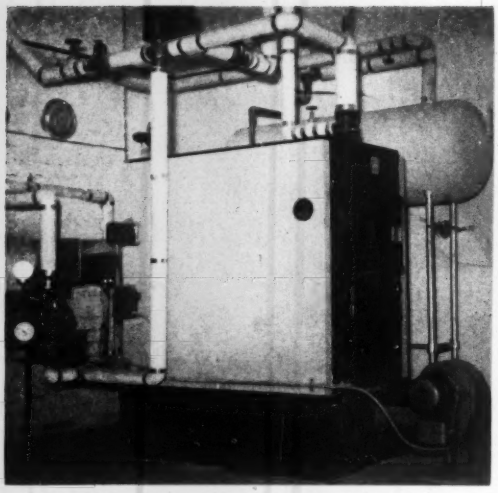
	1	2	3	4	5	6	Δ_1	Σ_1	Δ_1'	Σ_1'
1	6.161620	−.367935	−.088621	.012851	−.065760	.740656	.107115	1.338251	.660000	8.245797
2	−2.267096	.644422	.893820	.416868	−.214797	−.161897	1.616041	2.147116	1.122440	1.491005
3	−.546051	.579023	6.060634	−.594333	.284218	.068926	.540865	1.028697	1.464736	2.261988
4	.079061	.288496	−5.431504	1.216347	.901985	.152544	.287778	2.342302	.350031	2.848053
5	−.405376	.149153	1.768227	1.091127	2.606635	.014344	−.171652	.542888	−.447453	2.169101
6	4.563639	.112425	.419115	.185548	.037810	.486395	−1.682711	−.682658	−.816468	−.352061

3
E = 24 ·10⁶ psi
I = 35.14 in⁴
EI = 795.36 ·10⁶ lb in²
Q = 100 in.
Q² = 1 ·10⁴ in²
f_1 = EI/Q³ = 795.36 lb/in.
f_2 = Qf₁ = 79536. lb

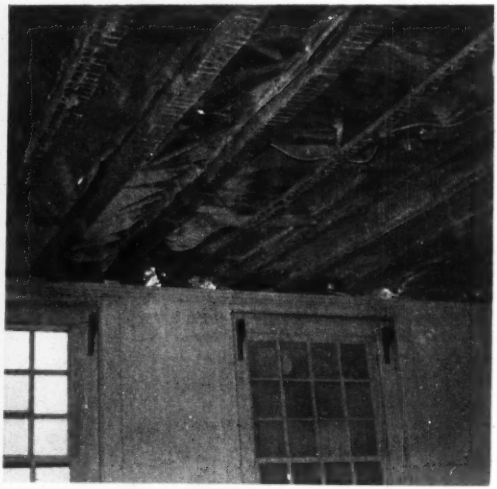
4 FINAL MATRIX (Start at Bottom)

	Factor	Final Result	Units
F_1	2.223488	795.36	1768.47
F_2	2.226541	795.36	1770.90
F_3	.780673	795.36	621.06
F_4	.477814	79536.	63863
F_5	−.147178	79536.	−11706
F_6	−.[illegible]	79536.	−1[illegible]39

Fractions of 10⁴ — Units: Pounds; Pounds; Inch-Pounds



THIS OIL FIRED BOILER supplies standing radiators in the service wing, ceiling coils in the museum portion of the building



ALUMINUM FOIL FACED BLANKET insulation is used in the second floor ceiling. Photo shows ceiling before new lath was applied. Note hand hewn joists

Old House To New Museum

Installing Heating the Chief Problem in Restoring 185 Year Old "Rock Hall"

By Arthur L. Zigas, Mechanical Engineer
Chapman, Evans & Delehanty, Architects and Engineers

IN ORDER TO PRESERVE the fine interiors of a structure built in 1765 when it was recently converted to a public museum, it was decided to use ceiling radiant panels to minimize the necessary cutting and patching. A one pipe forced hot water system using standing cast iron radiators heats the building's service wing

A 185 YEAR OLD BUILDING was presented — through the generosity of the Hewlett family — the town of Hempstead, N. Y. to be restored as a public museum.

The structure — known as Rock Hall — was built about 1765 and is located in Lawrence, Long Island. It is a three story, gambrel roofed. white shingled house and is an outstanding example of English Georgian architecture with Dutch execution. In 1831, the old kitchen building and slave quarters on the lawn to the west were removed and a "modern" wing housing the new kitchen and servants' quarters was added at the east end without disturbing the original structure.

One of the chief problems confronting the architects and engineers engaged for the restoration was the installation of mechanical services — particularly a heating system. The original section was heated by a fireplace in each of the rooms. The service wing was probably heated by portable stoves, since only two of the rooms had fireplaces. It would appear that after the service wing was built, Rock Hall was used only as a summer house and, there-

fore, no attempt at central heating was made.

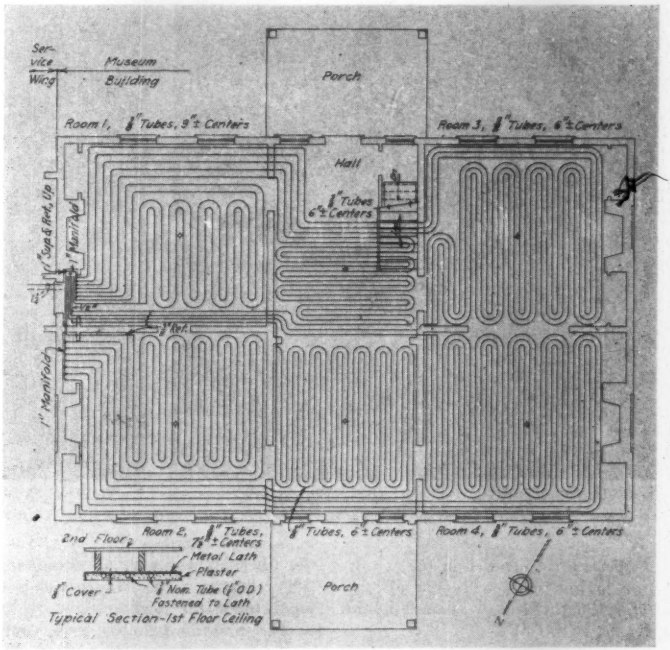
The new plan was to convert the modern wing into caretaker's quarters, supply rooms, public rest rooms, boiler room and office. For this section, therefore, a conventional heating system could be installed without any difficulty.

However, in the museum portion of the building — that is, the original three story house — the problem was considerably more complex. The walls of the entire structure are wood paneled, with only the ceilings being plastered. In order to preserve the fine interiors, the selection of the type of heating and heating elements presented something of a problem.

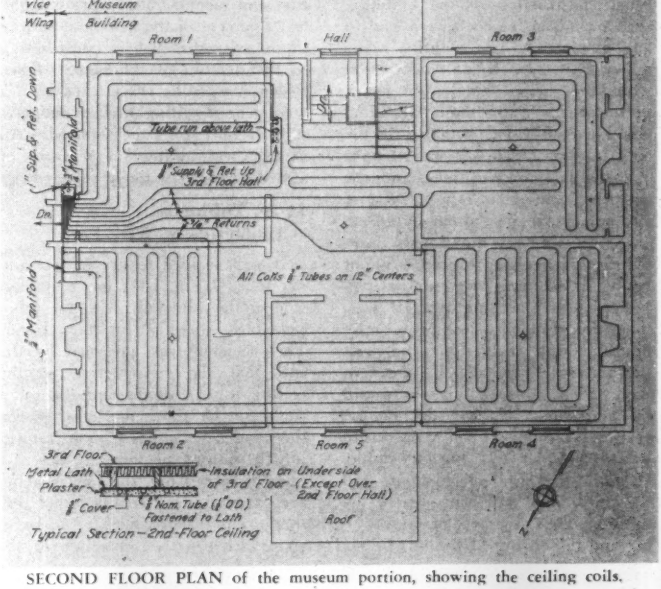
After the plans of Rock Hall had been reviewed, and after many visits to it, it was finally decided to use ceiling radiant panels. Since the existing plaster ceilings were found to be in poor condition and of no historic or aesthetic value, it was decided to take them down and put up new ceilings. In this way, a heating system could be installed with a minimum amount of cutting and patching. At the same time, by using the ceilings as the heating elements, it was possible to preserve faithfully the historic interiors.

To simplify the installation further, a one pipe forced hot water system with standing cast iron radiators was selected for the service wing. One oil fired cast iron hot water boiler is used, with the service wing and museum each on a separate zone. The service wing zone circulator is controlled by a conventional on-off clock thermostat in the caretaker's living room.

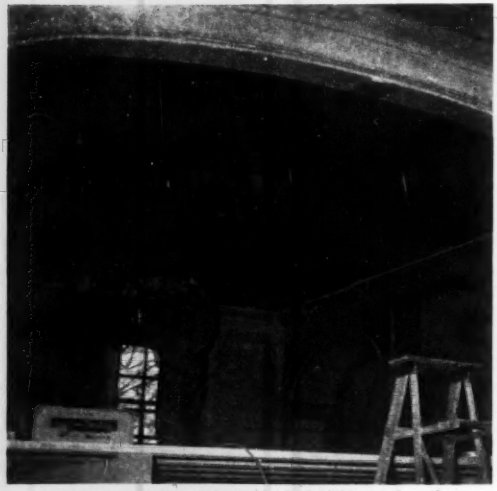
Again, to preserve the beauty of the hand carved wood paneling in the museum and to prevent tampering by the public, an electric control system was selected using a modulating three-way mixing valve controlled by the leaving water temperature. The control point is proportionately reset by an outside controller; thus, the radiant panel temperature is varied according to outside conditions, with no thermostat in the museum itself. The museum zone circulator automatically cuts out when the outdoor temperature rises above a predetermined setting. As a precaution against possible plaster failure, a high limit



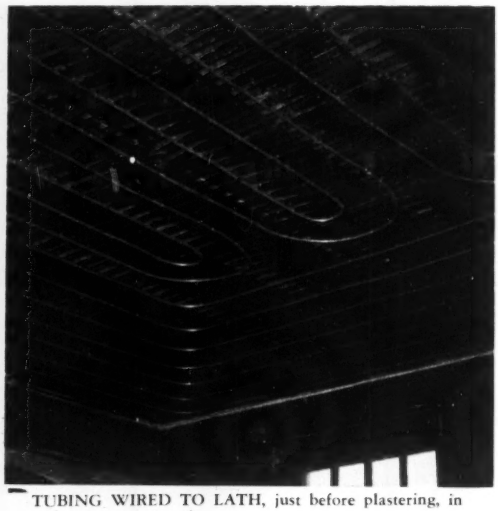
FIRST FLOOR PLAN of the museum building, showing the layout of the ceiling coils



SECOND FLOOR PLAN of the museum portion, showing the ceiling coils. The ceiling is insulated



WIRING TUBING TO METAL LATH, in first floor room No. 3. The plaster cover is 3/8 in.



TUBING WIRED TO LATH, just before plastering, in first floor room No. 1

temperature controller in the supply line to the panel will shut off the pump if the supply water should go above 130 F.

Each Heat Transfer Coefficient Calculated

The heat loss computations for the service wing were not unusual, but again the museum section presented some problems. Because of the unusual construction of the building, each heat transfer coefficient had to be calculated. The exterior walls are of barn type frame construction with hand hewn shingles on heavy nailing strips, but without sheathing. Hand carved wood paneling is the only interior finish. It was obvious that the lack of sheathing and the unequal spacing of the structural members made insulation of the exterior walls a very questionable procedure, particularly since it might result in marring the external appearance of the building. It was, therefore, decided to compromise by omitting wall insulation, and heat the museum to only 60 F on a zero day. Since museum visitors would be adequately clothed during the heating season, a 60 deg temperature would not be too uncomfortable. Only the first and second floors and the third floor hall are open to the public. Thus, the second floor ceiling and the ceiling of the third floor hall were insulated to minimize back losses. The insulation used is a 3 in. fiber blanket with an aluminum foil reflective facing, which was put up between the joists.

The first floor losses were computed, using the crack method for figuring the high infiltration, and the unheated mean radiant temperature (UMRT) was found to be 55 F. The required surface temperature of the first floor ceilings is 85 F. As there is no insulation between the first and second floors, approximately 20 percent of the first floor ceiling input was estimated as contributing to the heating of the second floor. Because of this floor heating, a second floor ceiling surface temperature of only 74 F is required. An average coil water temperature of 120 deg was tentatively selected.

3/8 In. Tubing on Underside of Wire Lath

It was decided to use 3/8 in. copper tube (1/2 in. OD) on the underside of the wire lath, with the tubes imbedded directly in the plaster. This decision was governed by the fact that the construction of the ceiling was in doubt and the tubes could not be above the lath between the hand hewn joists without requiring the cutting of joists.

As it turned out, the joist spacing was irregular, but it was found that there was approximately a 1 in. space between the underside of the joists and the top of the intricate cornice. This allowed the acceptable plaster cover of 3/8 in. over the tubes.

The tube spacing in the first floor ceiling varies from 6 to 9 in., depending on the room exposure. The only acceptable space for the risers was in the side cupboards adjacent to the service wing. With the small diameter tube used, it became necessary to run circuits in parallel; in the west rooms, three circuits in parallel are required to keep friction losses to a minimum. After the coils had been laid out, a 20 F water differential was selected. A lower differential with higher water quantities would result in extremely high velocities and friction losses. It was felt that a higher differential would present problems of uneven expansion where supply and return lines ran alongside one another.

The second floor ceiling coils were installed at 12 in. centers throughout, with only the farthest coil requiring two circuits in parallel. The coil in the sloping ceiling of the third floor-stair hall was similarly installed, but with a separate 1/4 in. vent line brought down into a closet.

After the old ceilings were taken down, new wire lath was installed below the joists and the tubes wired to the lath. The only trouble encountered during the installation resulted from the fact that the joists in the halls were found to be slightly lower than those in the adjacent rooms. It was therefore necessary

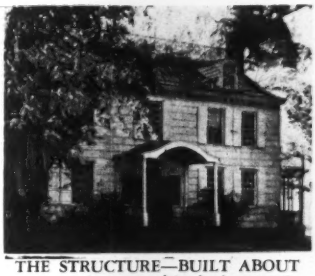
to install additional air vents which were carefully snaked between the joists to access locations. Over 4600 ft of 3/8 in. type L copper tube was used (furnished in 100 ft coils.) No swaging was permitted and all joints were made up with 95-5 tin-antimony solder after being sized with a 3/8 in. sizing tool.

Testing and Starting the Heating System

Before plaster was applied, the coils were tested at over 200 psi for 4 hr. After the ceilings had been plastered and were thoroughly cured, the system was slowly filled with water. Each coil was flushed separately to remove air by closing the return cocks on all other coils. The water temperature was slowly brought up to approximately 20 deg above the room temperature and maintained for over 48 hr while all rooms were adequately ventilated. The water temperature was then raised approximately 15 deg per day until the maximum of 130 F was reached. Finally, the panels were balanced with the return cocks in the furred access space over the archways between the two buildings.

The heating system was put into operation under full automatic control early last September. On December 17, when the outdoor temperature dropped to 3 F with a 10 mph west wind, the average museum temperature was maintained at the design temperature of 60 F.

In spite of the fact that the complexity of the installation created



THE STRUCTURE—BUILT ABOUT 1765—as it appeared in the late 1920's.

many difficult problems, the only untoward development since the system was put into operation has been the appearance, in two of the first floor rooms, of a faint hairline crack in the ceiling, parallel to the imbedded tubes and approximately 6 ft long. These cracks were undoubtedly caused by the shrinkage of the heavy plaster required to align the ceiling with the original wood cornices rather than by any fault of the heating system itself. It is felt, however, that once these have been eliminated, there will be no further difficulty.

The first heating season was recently completed with a total oil consumption within 5 percent of the estimate — thereby indirectly confirming the selection and computation of the building heat transfer coefficients (the ASHVE Guide was used as a reference).

Robert F. Godesky, Hewlett, N.Y., was the general contractor and Smith Brothers Co., Far Rockaway, N.Y., was the heating contractor.

BOOMING BIRTH RATE AIDS CONSTRUCTION INDUSTRY

THE CONSTRUCTION industry can take great comfort from the booming birth rate in this country, says Thomas S. Holden, president of F. W. Dodge Corp., construction news and marketing specialists.

By means of statistics, Mr. Holden establishes that birth rates and construction rates move closely together.

"Population growth is obviously a stimulator of construction demand in a dynamic society like ours," he says, in the Architectural Record. "The 1930-40 decade had a little over half the number of new persons that were added in the previous decade; it had a 58 percent decrease in number of new non-farm dwelling units and a 38 percent decrease in total construction volume.

"The 1940-50 decade had a 116 percent increase over the depression decade in the number of new persons added to population; it had a 115 percent increase in new non-farm dwelling units and a 33 percent increase in total construction volume.

"These comparisons illustrate an important relationship although they do not provide any mathematical formula for measuring the relationship. Growth is the primary creator of construction demand."

"The immediate building program for wartime and postwar babies," Mr. Holden says, "is a school building program which has already reached boom proportions and promises to continue at boom levels for quite a spell ahead."

He says the school-age population, age five to 17, is expected to move upward from 31.6 million in 1950 to 43.1 million in 1960.

"Just now the elementary schools are booming and they will continue to boom through 1958 — perhaps longer if the birth rate holds up. The high school boom will definitely carry over beyond 1960 and then will come the turn of the colleges," Mr. Holden states.

"Babies do not immediately require new houses," he continues. "But as they grow a little older and acquire little brothers and sisters, their parents are very likely to build on additions or to move into bigger houses. With prosperity they will want the bigger houses to have more spacious rooms as well as more rooms and to be generally better than the two-bedroom GI houses the first babies were brought home to.

"Along with the schools and the bigger and better houses will come demands for community facilities of all kinds, public and private. Water supply and electric facilities will have to be expanded; neighborhood stores and drive-in shopping centers will increase; public health and recreation facilities, churches and parish houses and Sunday school rooms will be required: in fact, every type of facility for civilized living."

FLOOR COILS WARM FEET IN REFRIGERATED SPACE

HOW DO YOU KEEP employees contented when they have to work in an icebox? That was the problem confronting operators of the Cashmere Fruit Growers' Union plant at Cashmere Valley, Washington.

To keep fruit in picked-fresh condition, temperatures in the buildings must be held at approximately 50 F. Because of this, workers in the processing areas complained of cold feet.

A happy solution was reached when radiant heating coils of wrought iron pipe were installed beneath the floors of the work areas. Steam is circulated through the coils. The result is that employees are kept comfortable, even though the radiant heating system has little effect on the temperature of the air in the building.

Why Precision Manufacturing Plants Are Air Conditioned

S. M. Miner, Industrial Sales Manager, Central District, York Corp., reviews the reasons for and the advantages of air conditioning for precision manufacturing plants. Industrial plant air conditioning is not an outgrowth of comfort air conditioning but rather its predecessor, the author points out

THE TWO PRIMARY motives for air conditioning in manufacturing plants are the requirements of the product itself and the promotion of production efficiency. The American Society of Refrigerating Engineers has segregated industrial air conditioning installations into two categories:

1) Plants in which the prime considerations for air conditioning are improved production, comfort of the workers, modernization, dust elimination, etc., in which air conditioning, while readily justifiable and a definite plus, is not indispensable to the conduct of business. Plants engaged in precision manufacture to close tolerances, engine parts and assembly plants, etc., are examples.

2) Plants devoted to manufacturing processes in which some form of atmospheric control, from the minimum control of relative humidity only to the ultimate complete air conditioning, is absolutely indispensable.

The types of installations which this article is intended to cover are:

1) Installations considered as precision machining primarily the metal working industries, where extremes of tolerance or surface finish control are found. Some examples are the manufacture of ball bearings, governor parts and small machine high precision parts.

2) Allied to precision machining operations are plants in which precision assembly is the primary function. This category includes any manufacturing operation in which highly finished parts are assembled into a finished machine.

3) Quality production operations such as the manufacture of radios and radio parts and the working with hygroscopic products.

23 Reasons for Air Conditioning

The Air Conditioning and Refrigerating Machinery Association has listed the functional uses of air conditioning and refrigeration as related to industry. It is interesting to note the large number of applications which fall within the category of precision manufacturing air conditioning. The following were taken from that list:

1) Precision assembly spaces.

2) Production of interchangeable precision parts.

3) Inspection and testing of finished parts.

4) Control of temperature, humidity and air cleanliness to insure uniform high quality of product in precision manufacturing spaces.

5) Conservation of critical raw materials, machine tool capacity and skilled manpower—minimizing of rejects and spoilage.

6) Storage of vital metals, instruments and tools.

7) Storage of precision machinery.

8) Manufacture and assembly of telephone, radio and other communication equipment.

9) Control rooms and other spaces where delicate and sensitive apparatus are in continual operation.

10) Spaces where communications equipment in continual operation generates considerable heat.

11) Monitor or isolated stations where automatic equipment is in operation without attendants.

12) To prevent dust and grit from spoiling the finish necessary on aircraft engine parts.

13) To avoid tarnishing and rusting of metal parts by preventing perspiration on employee's hands.

14) To decrease scrap loss caused by dimensional variations and by scratches on highly polished surfaces.

15) To maintain uniform temperature for close measurements in inspection rooms.

16) To prevent loss in production efficiency where standards of high production require concentrations of lights, power and people.

17) Inspection rooms, gage rooms, tool rooms and instrument assembly rooms.

18) To provide atmospheric control for finishing of machine tools, ball bearings and gages.

19) To provide atmospheric control in the manufacture of abrasive products.

20) To provide atmospheric control to prevent abrasive powders used in lens grinding from becoming ineffective due to their hygroscopic nature.

21) To provide temperature control in lens grinding for dimension control.

22) To prevent dust inclusion in assembling of precision instruments.

23) To provide atmospheric control in testing rooms for calibration of instruments.

In order reasonably to limit the scope of this article, certain specific applications are not included — printing and lithographing, pharmaceuticals, textiles and the photogra-

phic industry, for example. Certain of the tremendous wartime installations, such as the large bomber plants, will not be included except as to the general principles involved. In many cases, these plants were influenced by the necessity for blackout buildings and furthermore they do not seem to represent the future trend in the industry. Certain special applications will not be considered, such as drying rooms and test chambers. Unitary apparatus type installations, such as gage rooms and laboratories, will also be excluded.

It is not practical to give all the details of every aspect of even those precision manufacturing industries which are covered.

Not An Outgrowth of Comfort Conditioning

World War II and its demand for highly mechanized equipment served as a great stimulus to industrial plant air conditioning. However, the origins of true industrial plant air conditioning are much older. Today, there is a tendency to look upon industrial air conditioning as an outgrowth of human comfort air conditioning. However, the human comfort air conditioning field was practically undeveloped until the early 1920's. Industrial air conditioning, on the other hand, was applied in several plants during the early 1900's. Installations at that time were primarily in lithographing plants and textile mills. In the period from 1911 to 1915 air conditioning was installed in an instrument manufacturing plant as well as in one of the automotive plants. World War I gave impetus to the growing industry with the air conditioning of munitions plants and wooden aircraft assembly plants. The period between the wars found an ever-increasing number of widely scattered industrial air conditioning installations. In the early 1930's, the "Controlled Conditions" plant—one of its key items being air conditioning.—was brought forth.

The development of industrial air conditioning in the United States has considerably surpassed its corresponding development in European countries. This has probably been due in part to climatic variations but it can also be attributed to the basic difference in manufacturing methods.

There is a definite distinction between precision manufacturing and precision air conditioning. Precision air conditioning may be defined as any air conditioning where strict tolerance limits on temperature and humidity are applied in the nature of 1 F dry bulb or 2 percent relative humidity. There are few applications in industry where such requirements apply. Considerable leeway in both temperature and humidity will be noted. Precision air conditioning is seldom required by the product itself and certainly worker efficiency or comfort does not call for it.

A prominent consulting engineer recently stated the aim of industrial air conditioning to be "to produce conditions in which people can work free of the discomforts caused by temperature, humidity, excessive air motion, odor, noise and dirt. In the well conditioned space, the occupant should be oblivious to atmospheric conditions. It is not the purpose of air conditioning to make people comfortably warm or comfortably cool." In the present article, the word "precision" should not be associated with the air conditioning but rather with the type of manufacturing operations.

There is no logical reason for not considering air conditioning for old buildings. However, from a psychological standpoint, it appears that air conditioning for a manufacturing plant will usually be considered when one of the following three steps is contemplated:

1) The construction of a new plant or new building within a complete plant.

2) A change in the process, increase in the concentration of heat loads under an existing process, a revision in the production procedure on a given product.

3) Development of a new product.

Modern plant construction demands that some type of air conditioning be considered in the early planning stages. This was forcefully brought out by the wartime factory construction program. These new plants for wartime production raised the entire concept of housing modern industry to a permanently higher plane. In contrast to many prewar industrial plants, which just grew, and in which each new addition was compromised at the outset by existing conditions, the wartime plants were usually planned from the ground up. Thus, full advantage was taken of all architectural and engineering advances that had previously been applied only sparingly or piecemeal. As a result, planning of manufacturing facilities for satisfactory employee relations, as well as

THE FACTOR PROBABLY of primary importance in establishing the need for air conditioning space at one plant was the need for accurate temperature control to permit accuracy of gaging necessary for the selective assembly and sorting of parts

for other reasons, must today start from this newer and higher plane.

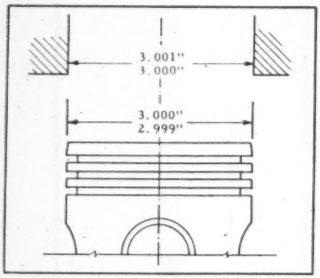
The Need for Air Conditioning

Probably the first technical reason for air conditioning in precision manufacturing is that air conditioning reduces the difficulties connected with close tolerances or the dimensional control of machining operations. The problems of tolerances, manufacturing limits, dimensional accuracy, gaging, fits and allowances, are part of a highly specialized branch of machine design and manufacturing operations. Full discussion of the subject is beyond the scope of this article. A very simple example of the problems encountered will serve to illustrate their complexity.

Assume that a machine designer has called for a piston and cylinder assembly having a 3 in. diameter. From machine design considerations (gas leakage, lubrication, etc.) he has determined that the acceptable clearance limit is between 0 and 1/1000 of an inch. A diagrammatic representation of the appearance of the piston and the cylinder manufacturing dimensions as they might show on a shop print are given in the accompanying sketch.

This is an example of a medium fit, comparable to an ASME No. 3, which is considered within the lower limits of strictly interchangeable parts. Without taking into consideration any of the vagaries of the gage manufacturer's tolerances, we can calculate, from the temperature coefficient of expansion and contraction, that if this assembly is made of aluminum there would be expansion or contraction of as much as 0.00090 in. with a 20 F temperature change. Obviously this would be beyond practical limits.

Table 1 gives the dimensional changes in various materials under air conditioned and unconditioned atmospheres.



PISTON AND CYLINDER manufacturing dimensions as they might show on a shop print. Air conditioning reduces difficulties connected with close tolerances or dimensional control of machining operations

With close precision manufacture, the wear of gages and gage-makers tolerances combined can make up almost one-half of the difference between "go" and "no go" dimensions at the design stage. Temperature control through air conditioning can assist in reducing the tolerance limits which must be allowed for and thereby reduce the number of losses or rejects.

As an alternative, selective assembly is frequently resorted to. Selective assembly as opposed to complete interchangeability is a much discussed subject among machine designers. Using the previous piston and cylinder example, the tolerance limits can be greatly widened if selective assembly or gaging is used to sort out possibly five or six different piston and cylinder sizes in groups. Each group's parts may come within the very close clearance limits. This of course brings up the problems of multiplicity of parts, large inventories, storage space, availability of replacement parts in the field, etc.

A third method of precision manufacturing is "tailor-made machining." One manufacturer of a high precision product contends that he can manufacture to plus or minus 1/10000 of an inch on a 20 in. diameter. However, each piece is "hand carved", gaged and assembled by highly experienced mechanics.

Present developments in machine shop practice indicate that, in the future, gaging or manufacturing temperatures will be specified on all drawings where close tolerances or accurate dimensions are given. Where parts may be manufactured in Detroit, Rochester, N. Y., and Dayton, to be later assembled in Rockford, Ill., there is often the problem of gaging and assembling parts which have been manufactured under temperatures ranging from 60 to 90 F.

This particular problem was encountered frequently during the war years and was solved by quality control and inspection departments throughout the country. Any tendency toward a vendor or sub-contractor type of manufacture and assembly of a precision item will aggravate this problem. Even within the confines of a given city or plant, the hourly and daily fluctuations in temperature and humidity can be ruinous when close tolerances are involved.

There are many reasons for closer tolerance requirements in modern machining operations. Higher speeds, increased pressures and the desire for less vibration are just a few of these. If manufacturers are to follow the trend toward increased rotative speeds in all mechanical equipment, then the manufacturing and gaging operations must be standardized. This requires highly accurate jigs and fixtures which of necessity have to be checked in a fixed temperature space. Higher speeds in rotative equipment are synonymous with closer fits and control of atmospheric conditions can help to minimize rejects.

It can be argued that all the technical difficulties of dimensional variation with temperature can be overcome by careful consideration of gaging temperatures, gaging errors, selective assembly, etc. Hence, while the air conditioning engineer should certainly make a point of the closer tolerance control feature of manu-

TABLE 1—DIMENSIONAL CHANGES in various materials

Material	Coefficient of linear expansion × 10,000	Expansion of a 3 in. piece (inches) Not air conditioned (range 67 to 100 F)	Air conditioned (range 76 to 80 F)
Aluminum	0.122 to 0.124	0.00123	0.000148
Brass (cast)	0.1042	0.00104	0.000124
Bronze	0.1024	0.00102	0.000122
Cast iron	0.0589	0.00059	0.000070
Magnelium (Al & Mg alloy)	0.1322	0.00132	0.000148
Nickel	0.0566	0.00057	0.000069
Steel	0.055 to 0.074	0.00065	0.000078
Tin	0.1275	0.00128	0.000154
Zinc	0.1653	0.00165	0.000200
Bakelite	0.122	0.00122	0.000146
Rubber	0.38 to 0.43	0.00400	0.000480

acturing in an air conditioned atmosphere, he should stress the value of dimensional control from its broader aspect—it is a measure of the general quality of the operations. The degree of dimensional accuracy and control in a manufacturing plant will usually be an indication of the overall general quality of the operation itself. Under these conditions, many of the other technical and general arguments for air conditioning will prove even more conclusive than the advantages of tolerance control.

While it appears that temperature control is of most importance in air conditioning, actually, humidity control is paramount. Humidity control is probably the primary technical reason for air conditioning in manufacturing operations requiring high quality finishes. For example, ball bearing surfaces are ground to a surface finish accurate to 1 millionth of an inch. Even a microscopic amount of moisture, such as perspiration on the hand, will attack the surface of a bearing and eat into its finish in a short time. Once in contact with the polished steel, the moisture cannot be easily removed and the corrosion will continue until the bearing is repolished. A manufacturer of piston rings found that a large number of the rejects were judged defective because of microscopic flaws from three sources—high relative humidity, rapid changes in temperature and perspiration.

In modern machine shop practice, the term "microfinish" is applied to very highly polished or lapped metal surfaces. A complete set of standards and gaging procedures has been established for measuring the quality of these surface finishes in the same way that gage blocks were developed for measuring accurate dimensions. There is a set of SAE standard block surfaces indicating the surface finishes available from various tools as used on various machines. An accurate surface gaging instrument, called a Profilometer, is in general use which measures the microfinish surface and applies a definite number to indicate the type of finish.

Following are a few easily recognized types of surface with the corresponding microfinish number:

Eye glass surface	No. 3
Plate glass surface	No. 4-5
Smoothly ground metal surfaces	No. 10-12

Many machine parts are finished about No. 5 while machinery governor parts are frequently finished to Nos. 3 and 4.

It has not been uncommon in many quality finish operations (ball bearing manufacture is an outstanding example) for a manufacturer to completely coat all unfinished products with a grease or oil at the end of a day's operations. The product remains coated overnight and the first operation the next morning is to clean the coated parts and prepare them to again be worked on. These greasing and cleaning operations are expensive and can be eliminated with proper air conditioning—which allows the parts to be left exposed in the air conditioned atmosphere without any danger of corrosion.

Humidity control is also important in the handling of hygroscopic materials. For example, temperature and humidity control are essential in the fabric covering handling departments in airplane manufacture. It is also required in the handling of most wood products to be worked to close tolerances. The manufacture of mimeograph materials is another example, as is abrasive wheel manufacture.

Cleanliness Is Important Reason

Another important reason for air conditioning is the requirement for cleanliness in precision manufacturing operations. Interest in air conditioning in a manufacturing plant often arises because of the necessity for dust elimination and proper ventilation. From these requirements, it is only a short step to complete air conditioning.

In establishing the air conditioning requirements for an optical assembly department at an arsenal, for example, the first reason given was the elimination of any lint or foreign particles that might be deposited on the optical instruments. The secondary objective was the reduction of high humidities which caused moisture to be trapped in the interior of the optical instruments. This moisture later condensed out when the instruments were used at low temperatures.

Extreme cleanliness is required to prevent scratching of metal surface finishes, blocking of small openings in machinery and scratching of closely fitted working parts. Cleanliness is also of psychological value; it serves as one more way of demonstrating to the workers the quality of operations required.

There are many operations in industry which benefit from or require standardized atmospheric conditions. Testing of the tripping mechanisms of small circuit breakers, calibration of instruments, gage testing, and others are examples. Here the need is for the ability to repeat or check results at any time—results which are affected by ambient conditions. If the vagaries of natural weather conditions must be coped with, lengthy calculations or delays will be required for comparative testing or calibration.

Many specific installations involve all or most of the technical reasons for air conditioning. For example, in the manufacture of ball bearings the air conditioning system performs the four essential jobs of:

1) Preventing stain-producing humidity from attacking finely finished bearing parts.

2) Helping to maintain accurate dimensional controls.

3) Maintaining a factory atmosphere free from lint and dust.

4) Preventing extreme summer temperatures from causing worker fatigue and lowering efficiency.

An automobile manufacturer's quality control engineer lists in the order of importance the following reasons for air conditioning:

1) Cleanliness.
2) Worker efficiency.
3) Prevention of rusting and corrosion.
4) Tolerance control.

Worker Efficiency An Elusive Factor

Probably the primary reason for air conditioning in production plants is to improve worker efficiency. This item comprises several factors so closely related that it is almost impossible to break them down. They would include:

1) Improved health conditions.
2) Reduction in absenteeism.
3) Increased safety.
4) Improved worker efficiency.

In spite of the fact that worker efficiency is of primary importance and is the factor most frequently considered and discussed by management when considering air condi-

SUPPLY AND EXHAUST ductwork and piping in the truss space of an air conditioned plant. Close tolerance production and finely finished parts at this plant make air conditioning mandatory

tioning, it is of such a general and elusive nature that statistics are scanty and inconclusive. Opinions and experiences of users and recognized authorities are often the only evidence that can be offered.

Most top managements will admit that fatigue comes sooner and more relentlessly when the temperature or humidity exceeds the normal comfort range. Almost every summer, the newspapers carry headlines on extreme weather conditions and their effect on production.

The possibilities of providing comfortable conditions for workers by means of ventilation were discussed in a series of articles. One article compares an air conditioning system with an ideally designed ventilation system. The former, it is pointed out, would provide comfortable working conditions to over 90 percent of workers during all working hours. The latter would provide conditions reported as comfortable to about 75 percent of the workers for about 50 percent of the summer daytime working hours. Even under these conditions, it was found that the first cost of the ventilation system will exceed the first cost of the air conditioning system whenever the internal heat gain exceeds 1 ton per 2400 sq ft of floor area. Where the heat gain is 1 ton per 600 sq ft, the saving in operating costs will require about 16 yr to justify the use of the ventilation system. This would seem to justify air conditioning especially when the added advantage of greater comfort for more workers for longer periods of time is considered.

In a report on the air conditioning program of a large automobile manufacturer, it was stressed that they recognized that air conditioning pays in increased production, more accurate processing, steadier output and particularly increased efficiency and health of all classes of workers.

In an American Management Association survey, 94 percent of the executives said air conditioning increased employee efficiency, 77 percent said it increased work done and 93 percent stated that it reduced fatigue.

The subject of reduction of absenteeism is more controversial. However, Dr. A. G. Young, Director of the Corey Hill Hospital, stated that, "Air conditioning has proven effective in combating the common cold because infective agents do not thrive under effective air conditioning." The American Management Association reports employee absence reduction due to air conditioning as follows:

Proctor and Gamble	27%
Philadelphia Electric Co.	29%
Tribune Tower (Chicago)	30%
United Service Auto. Ass'n.	27%

The increased productivity of employees due to air conditioning cannot be established in definite terms. It seems to be the consensus of most engineers that a 10 percent loss in efficiency during summer operations and a 5 percent loss during winter operations is attributable to atmospheric conditions. A New York state commission, studying the problem where heavy physical work is involved, gave figures for summer conditions indicating a drop of 15 percent in work accomplished when the temperature was raised from 68 F to 75 F with relative humidity held at 50 percent. If the temperature was raised to 86 F and the humidity allowed to go up to 80 percent, production dropped 28 percent. Stale air alone accounted for a production drop of 9 percent.

Regardless of previous concepts of mass and precision manufacturing, it has become increasingly evident that the workman has a vital and important role in maintaining the uniformity of a product and in reducing rejects. Keeping the same workman

on the same operation is one of the fundamentals. Crowding, excessive heat, noise and odors do not appeal to the majority of present-day work seekers, the less so since millions of them are now familiar with the last word in highly mechanized and partly automatic production.

Air Conditioning To Meet Competition

Air conditioning is often needed in industrial plants to meet competition, if for no other reason. This competition can be either from a publicity standpoint or from a cost of production standpoint.

An air conditioned plant enjoys a decided advantage over its nonconditioned competitors in worker procurement. Obviously if the pay and other considerations are equal, a worker will prefer employment in an air conditioned plant. An air conditioned plant, since it has more applicants, can hire the more skilled and higher type of workers.

There is one other factor in the worker efficiency or employee morale discussion which should be mentioned. Employee or union relationships within a factory can prevent the application of air conditioning to a portion of the plant. There have been instances of management desiring to install air conditioning in a section of a manufacturing plant where production operations, worker concentrations and other factors indicated its necessity or desirability. However, the remainder of the plant, with different operating conditions, did not seem to justify the installation of air conditioning. Many union and employee discussions were held in order to clarify the management's decision to air condition only a portion of the plant. This problem can become increasingly important on future installations.

In straight-line production, the motive for air conditioning lies on the borderline between a technical and a general reason.

With air conditioning, unusual atmospheric conditions can be controlled—hot spots, dust, fumes, etc. Hence, it is no longer necessary to segregate these steps in a production process. This factor is closely tied in with overall plant design. While it is difficult to evaluate, management recognizes it as a desirable feature.

A reduction in the amount of dust and dirt within a building reduces cleaning costs, lowers maintenance costs on machinery and can reduce troubles with dirt in electrical circuits. Air conditioned plants tend toward a reduction in window areas, particularly in the omission of skylights. There is an obvious reduction in the expense of window washing and maintenance. Window washing and its ally, reglazing, were estimated at $0.02 per sq ft of floor space per year in a typical plant. Reduced maintenance costs alone may throw the decision toward air conditioning when a new building is being considered.

The importance of the general reasons for air conditioning can be seen from the following quotation by an outstanding engineer in commenting on the "Controlled Conditions" plant: "It presents to the manufacturer the coming must for industry. It gives him at least one answer to the question, 'How can I continue to produce at a profit in the face of increased labor demands for higher wages, shorter hours and improved working conditions'. A controlled conditions plant strengthens management's hand in bargaining with labor, offering pleasant working conditions in return for increased labor productivity. It conserves manpower through health, higher morale, increased productive output and less labor turnover. It conserves materials with a more uniform finished product and less rejects. It conserves machines by preventing excessive wear due to dust and dirt."

[A second article by Mr. Miner will give information on the economic justification of industrial plant air conditioning and will include some design data.]

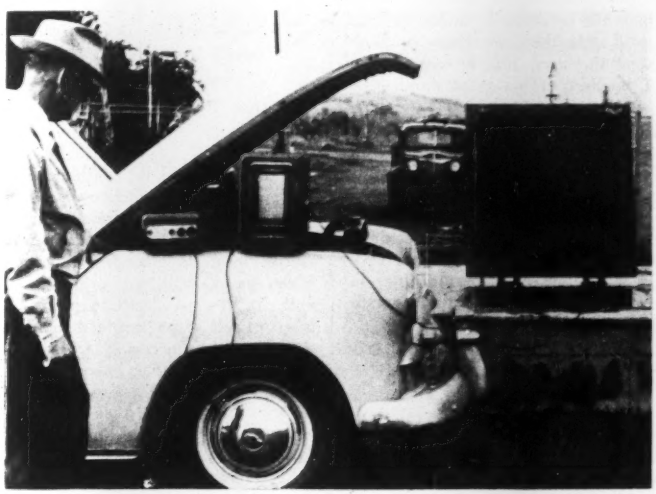
PHOTOELECTRIC RECORDER LOCATES PIPING CORROSION

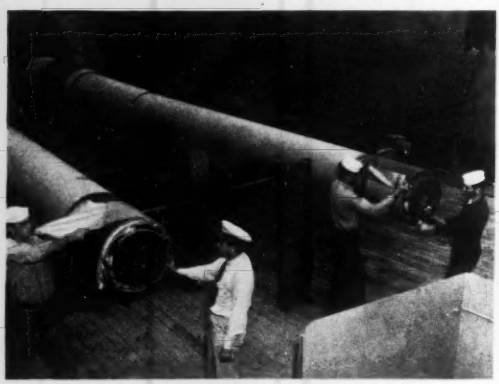
LOCATING CORROSION in water pipe lines of the East Bay Municipal Utility District in California has been simplified through the use of a photoelectric recorder.

Engineers of the district recently used the recorder to make electrolysis surveys of a 94 mile stretch of water pipe. Because of the portability of the instrument, the engineers were able to set it up in an automobile.

Each section surveyed was from 1500 to 3000 ft long, and contained concrete structures with manholes through which wires from the recorder were attached to the pipe. Wherever a drop in current was found, corrosion was indicated and the necessary repairs were made.

Due to the photoelectric recorder's fast response, the engineers were able to determine the location of fluctuating stray currents and take several feet of chart records to obtain average flow. They said the recorder had the advantage of not requiring constant balancing. [Photo courtesy General Electric Co.]





SHAKING OUT THE "MOTHBALLS" from the main battery of a battleship during her activation

THE SAME GUNS A FEW MONTHS later, delivering the Navy's "compliments" near Hungnam

The "Mothball Fleet" Pays Off

Reasons for and Results of the Navy's Dehumidification and Preservation Program

By Albert S. Gates, Jr.
Head, Dehumidification and Submarine Air Conditioning Sections
Bureau of Ships, Navy Department

PRESERVATION OF THE NAVY'S inactive ships under the so-called mothballing program involves a number of techniques — of which dehumidification is one of the most (if not the most) important. This authoritative article reviews the results, shows that the program has paid off. It suggests also that there may be many other applications of the same idea in industry

IN FIGHTING WORLD WAR II, the United States built a fleet greater than the combined navies of the world. At the same time, it eliminated the need for the larger part of its fleet. This great number of naval vessels of all kinds — which would be unemployed in a peaceful postwar world — constituted an enormous national capital investment which the Navy was determined to conserve for a possible future emergency. As the war drew to a close in the Pacific, the Navy set in motion the elaborate program by which this conservation was to be accomplished.

To carry out this program, a new naval organization called the Reserve Fleet — promptly labeled the "Mothball Fleet" in the public press — was established. To this organization was assigned the responsibility for preserving the inactive vessels in perpetual readiness. About 20 naval establishments on the continental coasts were designated as Reserve Fleet bases, with an organization called a Reserve Fleet Group at each base. Each vessel assigned to inactive status was to report to its designated Reserve Fleet base, where it was to be overhauled and preserved by its own crew and then be turned over to the Reserve Fleet Group. Its crew was to be reassigned or discharged in an orderly fashion dependent on the progress of the repair and preservation.

All illustrations are Official United States Navy Photographs.

Rapid Demobilization Hampered Program

The rapid demobilization knocked this elaborate program into a cocked hat. At its greatest wartime expansion, the naval manpower comprised only about 11 percent professional naval careerists of enlisted or commissioned rank — the remainder were Reserves. While there was fighting to do, the two groups were indistinguishable; there was the same

enthusiasm, the same confidence, the same pride in their branch of the service throughout. Many of the Reserves revealed themselves as naval careerists at heart by recognizing that demobilization was part of the job and by staying on (sometimes at considerable personal sacrifice) to see it through. For a greater number, however, as soon as the fighting was over the Navy became just another government bureau. It could try to salvage a lot of beat-up naval vessels which would never be used again if it wanted to, but it had no right to interfere with the jobs, careers and lives of private citizens by holding them in uniform for the purpose. The folks back home and the Congress agreed with them heartily.

When the point system for discharge came into effect, in a period of about six months the personnel of our magnificent wartime Navy melted away to a fraction of its wartime strength. The crews of the returning vessels, which were to have been held in the service until their vessels had been preserved, began to disintegrate as soon as the vessels hit the dock. I remember visiting one destroyer about six weeks after it had gotten back to the States; the skipper was an ensign who had inherited the vessel from a succession of six commanding officers since the vessel had returned. He had a skeleton crew, enough to keep the fires going in one boiler. He was also the skipper of five other destroyers moored alongside, on each of which there was no crew whatsoever. In many cases, when the Reserve Fleet took over, the vessel was moored, the doors were closed, and the fires were out — but otherwise practically nothing had been accomplished toward the ship's preservation.

The Reserve Fleet had inherited a shambles and seemed to be confronted with an impossible task. In many places the complete facilities of a naval base had to be built. Channels had to be dredged and piers constructed alongside which the vessels, temporarily moored in sheltered areas, could be docked. Housing had to be erected, power lines run, supply facilities established, and community services such as fire mains and water lines built. While this was going on, it was necessary to see that the moored vessels were not lost by accidental fires, rammed in the darkness, or blown away by hurricanes. During this time, of course, the vessels were supposed to be undergoing the process of repair and preservation, and incidentally, the Reserve Fleet personnel were supposed to be learning the necessary special techniques. Hopeless as the task looked, the Reserve Fleet went to work, tackling the biggest jobs first; they have been at it ever since. If they had stopped to look around at the end of 1947, they would have observed that they had gotten most of their vessels into a preservation status bearing some fair resemblance to that envisioned in the original program.

In working out the procedures, an unofficial goal of preserving the vessels for about 20 years was set, since it was considered that the usefulness of a naval vessel would be largely dissipated in 20 years by the "forced draft obsolescence" inherent in the developing techniques of naval warfare. Since preservation was not started until 1945 and not completed on all vessels until about 1947, it is still much too early to assume that the goal has been met. However, in line with the concept of readiness which has been a governing consideration for the Reserve Fleet, a number of vessels have been activated and assigned a period of active service with the Fleet, being replaced in the Reserve Fleet by inactivation of similar vessels. Also, a substantial number of vessels of all types were activated and returned to service and have seen duty in the fighting around Korea. From these activations it has become possible to draw some conclusions as to the effectiveness of the preservation techniques, the long range cost of the procedure and the strategic value of the whole Reserve Fleet concept.

What's Involved in Preservation

Before discussing the effectiveness of the preservation, it is well to set forth just exactly what the Navy was trying to do. The problem divides itself into four parts: the preservation of the underwater hull, the preservation of surfaces and equipment exposed to the weather, the preservation of the interior structure and of equipment exposed to the ambient air of the interior, and the preservation of working surfaces not exposed to the ambient air.

The preservation of the underwater hull is similar in most respects to the problem with an active vessel. It must be protected against corrosion of the metal and the growth of barnacles, weeds and slime. Some advantage is gained when the Reserve Fleet group is established at a location where water conditions are favorable to preservation. A disadvantage is involved in the fact that the intervals between dockings must be extended for economy's sake to much greater periods than for an active vessel. The preservation of the underwater hull has for the most part followed traditional lines, although recently the application of cathodic protection to prevent corrosion and the growth of some organisms has been resorted to with considerable success.

In the preservation of the equipment and structure exposed to the weather, a sheltered location for the berthing area furnishes some advantage. Some of the topside equipment can be removed and struck below into the dehumidified area. Some of the equipment which cannot be struck below — such as guns and winches — is packaged; that is, protected by an envelope and dehumidified in the same manner as the interior of the vessel. Protection of the remainder of the vessel exposed to the weather is largely a matter of paint. Some innovations have been tried out but for the most part this also follows traditional lines. It is a much more difficult problem on the Reserve Fleet, where a painting job must be made to last as long as possible without maintenance, than on an active vessel, where maintenance of the topside painting is a daily routine.

It is in the preservation of the interior where the greatest departures from previous practice have been made and to which the term "mothballing" is most aptly applied. The preservation of the interior by mothballing comprises two complementary techniques — dehumidification, and the use of thin film rust preventives. All the interior of the vessel is maintained at a low relative humidity — about 30 percent. All the materials and surfaces of whatever nature which are exposed to this dry air give up a large part of the water which they absorb or adsorb under normal humidity conditions. The

A SMALL SEGMENT of our mothballed fleet — a Reserve Fleet Group at San Diego

resulting low water concentration on such surfaces and in such materials is not sufficient for the processes of chemical corrosion and the growth of molds, mildew and rot to take place at any significant rates. Many surfaces requiring a high degree of preservation — for example, bearing and working surfaces on the interiors of internal combustion engines, compressors, pumps, turbines, etc. — will not dry out by exposure to the dehumidified atmosphere at a rate sufficient to forestall a significant extent of corrosion. On such surfaces, thin film rust preventives, which displace the adsorbed water and thus protect the surface from corrosion, are applied. It must be emphasized that the functions of these two procedures are complementary. The usefulness of either working alone would be only a fraction of their usefulness when working together.

How Effective Is "Mothballing"?

How successful in preserving the vessels have these two techniques proved to be? The best places to look for answers are in the reports of periodic inspections which are made of each vessel in the Reserve Fleet, in the reports issued by the Navy Yard which activates any vessel, and in the post-activation report made after a short period of service by the skipper of every vessel which is activated. In these reports every material defect which comes to light is listed, and if possible a diagnosis of the cause of the defect and a recommendation for improvement in the method of preservation is included.

From a casual perusal of the reports, certainly no one would jump to the conclusion that mothballing had been a complete and unqualified success. Each report is a volume of closely typewritten pages, and those coming in today are not much shorter than those which were written in 1945 and 1946. The great majority of items in these reports, however, prove to be deficiencies which can hardly be attributed to a failure of the preservation techniques.

In the first place, although the original program called for an overhaul of each vessel before it was inactivated, because of the lack of funds and personnel such overhauls were accomplished on only a few ships and most received emergency repairs only. The preservation procedures can arrest deterioration but cannot, unfortunately, repair deterioration which has already taken place. Most of the vessels reporting at the end of the war were overdue for overhaul and many of the defects now being reported were in existence when the vessel was inactivated.

Second, much of the preservation was originally accomplished in an inadequate and slap-dash fashion by inexperienced operators — again largely because of the rapid demobilization. For surfaces open to dehumidification and which can benefit from it, the preservation is improved as the vessel dries out — but those which require thin film rust preventives will suffer corrosion which cannot be discovered until the equipment is activated if there is any deficiency in the initial application. Similarly, ferrous piping systems must be drained and dried for proper preservation. Such systems are unbelievably extensive and complex on a naval vessel, and are very difficult to drain and dry under the most favorable circumstances. If the job is not properly done, the fact doesn't become apparent until the system is activated and tested.

Expanding Use of Dynamic Dehumidification

The reports are circulated among the technicians responsible for the various classes of material and are scanned intensively and in detail for evidences of deficiencies in the prescribed preservation techniques and instructions. Although such evidence seldom comes to light, from this scanning procedure and from the ingenuity of personnel in the Reserve Fleet, there have been substantial improvements in details of preservation with respect to many kinds of equipment and material.

For example, the use of static dehumidification — that is, the sealing of a compartment or enclosure with a charge of desiccant inside — has been largely supplanted by dynamic dehumidification, using automatic continuous machines, for all but certain small enclosures such as controller boxes. The use of sprayed plastic envelopes to enclose equipment exposed to the weather has been superseded by the use of sheet metal enclosures. It has been found practical to control the dehumidification by much simpler procedures than were originally thought to be necessary. On vessels now being inactivated, dynamic dehumidification of boilers, turbines, and piping is being considered for use in lieu of the thin film rust preventives originally used.

Dehumidification has also been found to have an undesirable effect on some materials. Some but not all of the wood items found in small quantities on modern naval vessels have suffered from the expected drying out at 30 percent relative humidity. Mess tables and meat chopping blocks are now painted with hot paraffin as a part of the preservation procedure. Water breakers suffer no permanent damage, but they shrink and fall apart

and must be properly assembled on reactivation. Fibrous material — such as cordage, canvas, mattress stuffing, etc. — become very brittle after a long exposure to 30 percent humidity and upon activation must be allowed to re-absorb sufficient moisture to reach equilibrium with the prevailing atmosphere before they are handled. It cannot be positively stated that these materials do not suffer some deterioration as a result of this cycle of drying and re-absorbing.

Correlation Between Humidity, Corrosion?

Although the Navy has had vessels under preservation for over five years, has had experience with dehumidified packages for several years before that, and has conducted extensive tests it cannot be said that we can express a definitive correlation between preservation at a given relative humidity and degree of corrosion.

We know that a clean surface of mild steel will probably experience some slight rusting over a period of time when exposed to 30 percent relative humidity. We know that a minimum of protection for this surface, such as would be afforded by a light, non-corrosive lubricant, will protect it satisfactorily for a long time in an atmosphere of 40 percent, 50 percent or even higher. We know that most other metals experience even less corrosion under controlled humidity conditions than mild steel. We know that the growth of mold, mildew and rot is practically stopped at 30 percent humidity and does not increase too significantly as the humidity is raised to 40, 50 or even 60 percent. There is some reason to believe that if both the temperature and humidity were closely controlled at a point which did not happen to coincide with a highly favorable environment for the growth of fungi, a humidity much higher than the 30 percent now maintained would be satisfactory.

What Are the Big Advantages?

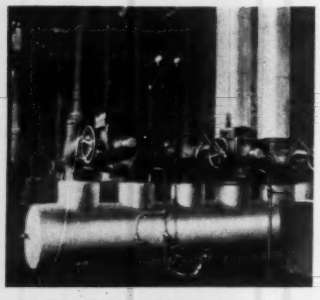
No specific and spectacular result can be ascribed to the application of controlled humidity and certainly there is nothing magic about the relative humidity of 30 percent at which most of the vessels are maintained. Yet the overall result of the application of the preservation contrasts to the procedures formerly used to a degree which can hardly be appreciated by anyone who did not have to activate for World War II one of the vessels preserved from World War I. Why does the present procedure, which after all is not so profoundly different in detail, present such a spectacular difference in the aggregate?

THE TEMPORARY DEHUMIDIFICATION piping must be gotten out of the way as an early step in activation

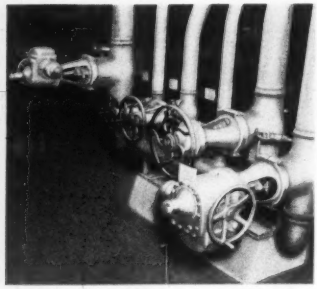
In the first place, with the old method anything not specifically preserved could be expected to deteriorate. With the present procedure the dehumidification affords a measure of preservation for everything, although certain items require additional preservation. Second, dehumidification eliminates mold, mildew and rot, which are hazards to a great number of different kinds of equipment but, perhaps more important, create a depressing atmosphere in which it is almost impossible to believe in the possibility of preserving the vessel. Third, the dehumidified vessel is almost entirely sealed off from the weather so that no dust accumulates and it remains very clean inside but at the same time it is accessible, well lighted, and has a pleasant atmosphere — all of which are conducive to thorough inspection. Fourth, dehumidification permits almost every kind of material except consumable supplies and dangerous materials to be left on the vessel, whereas formerly they had to be removed and stored. It also makes it possible to preserve in place and without dismantling, many items — such as electrical and electronic gear, engines, turbines and pumps — which formerly were dismantled for preservation. The idea of readiness — which is the keynote of the Reserve Fleet — then becomes an attainable objective, not an impossible ideal.

Perhaps most important of all, the new procedures change the direction in which the condition of the vessel may be expected to go. Whereas formerly with a maximum of effort it was possible to hope only to slow down an inevitable disintegration, with the new procedures, no matter how bad the present situation, it is possible to keep it from getting worse and to plan for gradually improving it. The Reserve Fleet not only devotes itself to maintaining the existing preservation of the vessels, but utilizes any excess manpower it may have for elimination of the defects and deficiencies uncovered by the periodic inspections. The original objective was to arrest the inevitable deterioration as much as possible; but, in fact, there has been a continual improvement in the condition of the vessels of the Reserve Fleet, fluctuating with the availability of funds and naval manpower. Many of the vessels now in the active Fleet would experience an improvement in their material condition as a result of a period in the Reserve Fleet. The Reserve Fleet has demonstrated that vessels can be preserved for an indefinite period without suffering deterioration except that from aging of materials.

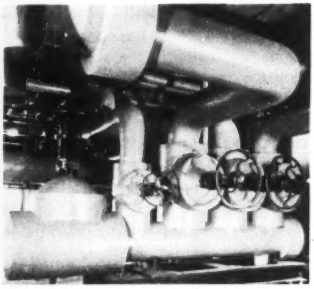
[This is the first of two articles by Mr. Gates.]



MAIN STEAM HEADER in a French plant. A short, compact header with two 14 in. and three 12 in. 1500 lb pressure-seal bonnet gate valves.



INDUSTRIAL PLANT POWER house main steam header equipped with 10, 12 and 14 in. 1500 lb gate valves at convenient operating level



VALVE ON END of this header is for future extension. Valves on branches are 5 in. and 10 in.

Put Headers, Valves Handy

Piping headers at low elevations and valves at hand-height promote plant economies and safer operation, says G. W. Hauck, Manager, Engineering Sales, Crane Co., and member of HPAC's board of consulting and contributing editors

LOCATING PIPING HEADERS at low elevations, thereby putting the adjacent and principal control valves at hand-height for quick and convenient operation, creates an ideal situation in practically all cases. This practice promotes economies and contributes to over-all safety in plants. Certainly, exceptions to this near-axiom must be rare.

A well-defined trend of some years ago has developed into widespread practice today. Header valves are no longer out of reach . . . they are down at convenient operating levels in very many modern plants. However, visits to power plants (some relatively new) disclose that an appreciable number still have headers up at awkward elevations, making it necessary to climb stairs, mount ladders to platforms, etc., in order to operate header valves. It may be timely, therefore, to re-emphasize the advantages which stem from the preferable practice of putting headers and valves near the operating floor level.

A piping system is analogous to other forms of transportation wherein central control or switching stations are required for efficient operation and sometimes for safety. This is best illustrated by focusing attention on main steam headers because they are the heart of power piping systems. One of the elements of good design involves the location of such headers so that the valves are at a convenient height for comfortable operation with a maximum of safety. This applies not only to main steam headers but equally to auxiliary headers, boiler feed discharge and suction headers, and the like.

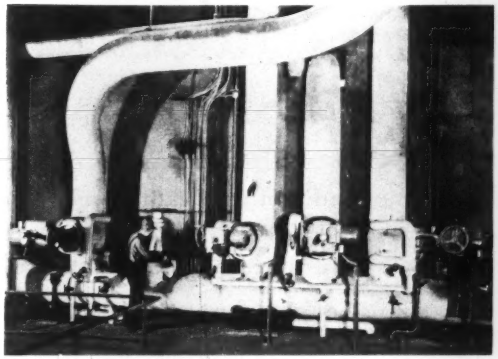
There Are a Number of Advantages

When the principal control valves are readily available for convenient operation, and the drip or drain valves as well, the plant dispenses with the loss of time otherwise spent in traveling between the operating floor and the control valve . . . resulting in economies.

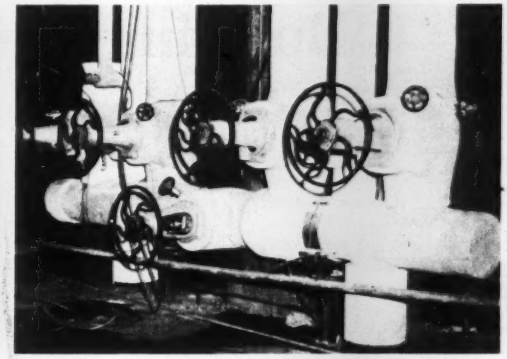
Valves in plain sight are likely to get quicker attention if a stuffing box requires adjustment or if the need for other maintenance becomes evident. Thus, further economies may be effected.

If the necessity of climbing stairs or mounting ladders is eliminated, the attendant element of constant risk is removed and over-all safety is promoted.

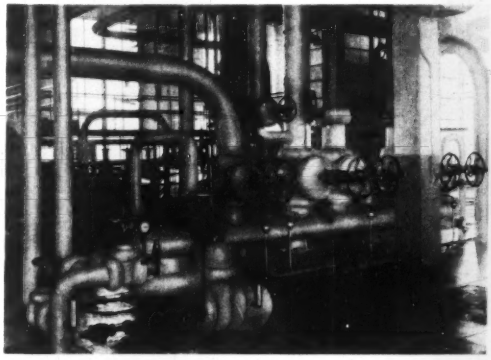
The basic theme of this article can be exemplified much better with pictures rather than with words. The accompanying photographs have been selected to show a variety of plants and installations. However, all of them reflect the fundamental advantages of putting headers and their valves at operating levels.



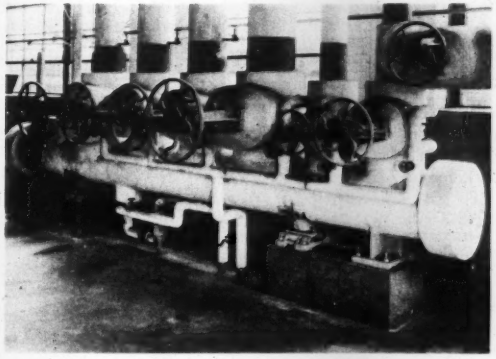
A CENTRAL STATION in the middle west put this header for 900 lb service at a convenient elevation for easy operation of the hand operated valves. All control valves are plainly visible from the operating floor



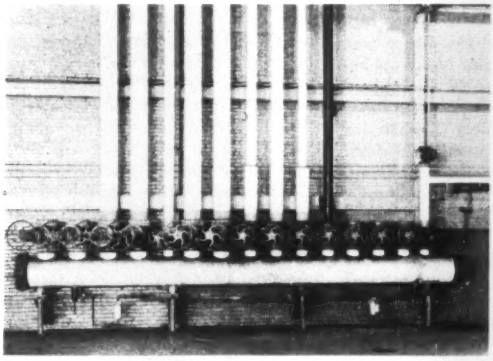
TWELVE INCH main steam header with 8 in. sectionalizing valve in center and with four 8 in., two 3 in., and two 1 in. valved connections. Over-all length of header is 15 ft, 8 in.; its center line is 3 ft, 0 in. above the floor



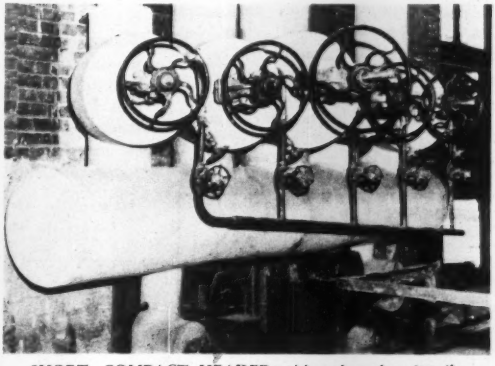
THIS HEADER AT a Mexican power plant is 21 ft, 9 in. long over-all, has two 2 in., four 8 in., and one 10 in. valved branches. All control valves, bypass valves and drip valves are readily accessible for operation from the floor



HEADER AND VALVES at this industrial plant boiler house are of 250 lb construction for operation at 145 psi. Modern design is just as advantageous in a relatively lower pressure plant as in larger central stations with higher pressures and temperatures



A VERY MODERN industrial plant contains this 16 in. header with inlets for two boilers and valved outlets for various steam services, plus provision for future expansion. Valves are for 300 lb service



SHORT, COMPACT HEADER with valves for 600 lb service in a municipal light plant in Arkansas. The compact grouping of main valves, bypass valves and drain valves is apparent — all are within easy reach

Building Managers Meet

. . . . . talk about air conditioning, heating and other things. Need for re-evaluating methods and equipment due to rising costs in recent years is stressed

THE 45TH ANNIVERSARY of the founding of the National Association of Building Owners and Managers and the 50th birthday of the Building Managers' Association of Chicago were marked at the national group's recent annual convention held in that city. Some of the problems in heating and air conditioning office buildings were discussed at the record-breaking meeting — along with such other subjects as formulas for estimating the time which should be spent in cleaning offices and office equipment, operator-less elevators for commercial buildings, rising costs, rental strategy, and so on.

Existing Buildings Must Air Condition

In a discussion on "making ends meet," Ralph E. Thomas, of Detroit, pointed out that as the rental rate of an older office building approaches that of a new air conditioned building in the same city, the older building's tenants consider moving. Thus, existing buildings must give more and more thought to air conditioning as newer conditioned buildings are constructed.

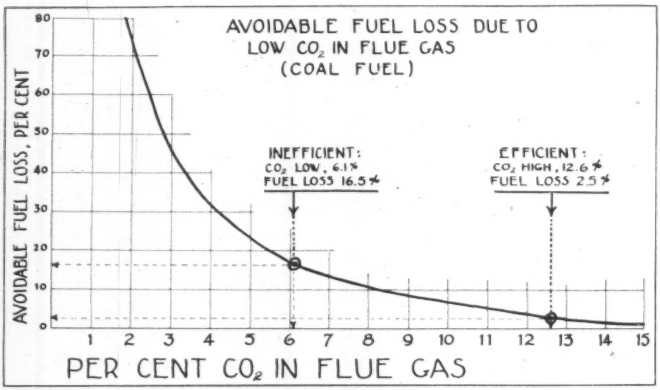
When an older building is air conditioned, its rental rates should go up 50 to 60 cents a square foot, he said, of which 25 to 30 cents represents costs and the balance the investment and depreciation.

Mr. Thomas mentioned that there is a possibility of depreciating (for income tax purposes) window air conditioners in three years, and that thus the renting of such units by a building to its tenants becomes an attractive source of income.

In concluding his remarks, Mr. Thomas stressed the need for greater mechanization in office buildings because of rising labor costs, and said that 12 to 14 cents of every dollar taken in by a building is spent for cleaning. Air conditioning tends to reduce cleaning costs, it is believed.

"QUOTE"

"The difference in the way we talk about each other here and at the bar is amazing."—*George R. Bailey, Chicago, in acknowledging the chairman's complimentary introduction, before giving his talk on operator-less elevators at the National Association of Building Owners and Managers convention.*


AVOIDABLE FUEL LOSS DUE TO LOW CO_2 IN FLUE GAS (COAL FUEL)
INEFFICIENT: CO_2 LOW, 6.1% FUEL LOSS 16.5%
EFFICIENT: CO_2 HIGH, 12.6% FUEL LOSS 2.5%
AVOIDABLE FUEL LOSS, PER CENT
0 10 20 30 40 50 60 70 80
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
PER CENT CO_2 IN FLUE GAS

Automatic Heating, Controls Pay Off

E. W. Murray, of Kansas City, spoke on "engineer-less basements" (automatic boiler rooms), and said that heating is the major "basement activity" in an office building. Because "heating labor costs have increased 137 percent in the last decade", a re-appraisal at the present time of the necessary expenditures for controls and other more automatic heating equipment is indicated. Heating is the fourth largest item of expense in an office building, he said, and he gave an "average" figure of 10.1 cents per square foot.

There are real opportunities for making savings in buildings using manual heating control, he pointed out, as employees are freed for other duties and as automatic controls lead to marked savings in steam consumption. He then reviewed briefly several actual examples where excellent savings — at small investment costs — have been made with automatic controls and automatic firing. He stressed, too, the opportunities for saving money with mechanical coal and ash handling, and said that in some cases equipment of this kind had paid for itself in two years in comparatively small plants.

In discussing gas-oil combination firing, he said this development is "a child of economic happenstance." Firing a boiler by this method may be mandatory or may be desirable in a particular locality, for it is some-

times required by the gas company or, in other cases, there are rate advantages to the building.

Summarizing his remarks, Mr. Murray said that labor saving is one of many opportunities which building management has. Each possibility must be appraised in the light of ever-increasing labor costs. Changes won't come overnight, but "we must work in this direction in our long-range planning."

Study Changes and Re-Evaluate Decisions

Rex Hieronymus, of Chicago (a member of HPAC's board of consulting and contributing editors), gave data on the cost of steam and fuel equivalents for coal, oil and gas for his city. He said that a combination of gas and oil is often the favorable choice because of labor savings.

He pointed out that the picture insofar as gas is concerned is expected to change. The low summertime rate is in effect to improve the utility's load factor, but with underground storage of gas during the summer (as in the development near Kankakee, Ill.) it is likely that summertime gas will no longer be available in Chicago at a low "dump rate" as it will be stored for house heating use — at the higher rate — the following winter.

Because of changes in the costs of fuel and labor, Mr. Hieronymus said that buildings should re-evaluate the question of generating or buying steam for heating. A decision on this matter made in 1932 may no longer be correct in 1952 because of such changes.

Mr. Hieronymus stressed the importance of good operation to save fuel and money, centering his remarks around a chart of avoidable fuel loss with different efficiencies. He said it was not uncommon, with careless operation, to find the CO_2 in the flue gas as low as 3 or 4 percent. He mentioned that complete absence of smoke does not prove efficient operation — but that smoke does prove inefficient combustion. He said that it is perfectly possible with good equipment and good operation to have the CO_2 be 12 or 12½ percent, in which case the avoidable fuel loss is but 2½ percent. The CO_2 content of the flue gas may be found with an inexpensive portable instrument; in any reasonably large plant, a recording CO_2 analyzer is a must, he stated.

In conclusion, he stressed the importance of using the proper equipment and quoted the statement that "when you need something, you pay for it whether you have it or not — so you might as well have it."

James M. Bradford, of Seattle, was elected national president, succeeding James F. Cook, Jr., of St. Louis. The 1953 convention will be held in Pittsburgh, the 1954 in Denver, and the 1955 in Cincinnati.

KROESCHELL OFFERS PLANNED AIR CONDITIONING PROGRAM

The Kroeschell Engineering Co., 215 W. Ontario St., Chicago 10, recently issued two attractive booklets — one on the facilities and field of operation of the Kroeschell organization for doing air conditioning, heating, power and process piping, refrigeration and ventilation work, and the other on a planned program for conditioning existing buildings.

The planned program for air conditioning a multi-story building is compared in the booklet to the growth of a tree.

"The vertical risers for air, water or steam represent the trunk of the tree. Normally, this should be planted first, and will cost about 15 percent of the total investment.

"The roots are represented by the refrigerating equipment, heat exchangers, etc., in the basement, which can be installed in multiple units as required to match the addition of air conditioned spaces. This portion of the system will cost about 30 percent of the total investment.

"Fan systems, ducts and/or window cabinets to supply conditioned air, in any section of the building, wherever and whenever desired, represent the branches of the tree. This portion of the tree may be planted first to be used for ventilation only, until the complete air conditioning program is started. This portion of the system will cost approximately 55 percent of the total investment.

"The planned program makes it practical to start with an initial investment as low as 10 percent of the total, by installing parts of the 'trunk' and 'roots'. Each part installed, from the start to maturity, remains part of the system.

"When the age of a building has passed the 30 year mark, it may be necessary to make extensive repairs to the heating and/or ventilating systems. This is the time consideration should be given to starting the planned program to correct the immediate problem and to prepare for air conditioning.

"The cost of air conditioning must, eventually, be paid by the tenant in some form, and becomes an earning investment for the building.

"When the tenant pays the cost of the 'branches' only assigned to his rented area, he generally depreciates his investment over the term of his lease; the tenant may then pay the additional rent to cover the owner's investment in the 'trunk' and the 'roots,' plus operating cost."

SAYS AIR CONDITIONING CAN PROTECT HEART PATIENTS

Constant living in high temperatures can actually cause a heart attack in a person with a weak heart and can cause complete collapse in those actually suffering from chronic heart disease, according to a report to the Mitchell Air Conditioning Research Foundation. Air conditioning in hot weather can have an equal effect in combatting such attacks, the report indicates.

The report combined and evaluated experiments conducted over a period of 30 years. The experiments were conducted in almost every situation where men have been forced to work and live in hot climates. Among these were studies conducted during desert battles in World War II, and during construction projects in the American desert and in the tropics. "Many of the most valuable studies, however, were conducted under strict clinical conditions with volunteer subjects," stated Bernard A. Mitchell, room air conditioner manufacturer.

Air conditioning was recommended in the report as the best method of combatting the effects of heat, especially for heart patients and elderly people. Heart patients "especially should avoid extremes of temperature, by artificial means if the conditions warrant," the report emphasizes.

"Marked fluctuations in conditions, particularly repeated or prolonged increases in temperature or humidity, are as harmful as excessive physical activity and should be carefully guarded against."

Analyzing Pipe Line Networks

A Review of Methods, Emphasizing the Nonlinear Electrical Analogy Process

By Malcolm S. McIlroy

Professor of Electrical Engineering, Cornell University, and Consultant to The Standard Electric Time Co.

ALTHOUGH NETWORKS OF pipe lines or ducts are used throughout the civilized world, the analysis of their expected steady-state performance, as an aid to design, has been a difficult and time-consuming process. The work involved in evaluating flows and pressures has often discouraged engineers from making thorough comparisons among alternate plans for construction and operation.

The recent development of an electrical-analogy method of solution employing a network of special nonlinear resistors eliminates the tedious computations formerly needed and quickly provides information desired about the performance of complex pipe line networks.

The purpose here is to review the history of methods of pipe line network analysis and to describe and discuss the general features of the nonlinear electrical-analogy method. Since detailed technical information required in applying the procedure in specific fields has been (or soon will be) published in journals of technical societies, only basic principles are given here.

Radial Systems and Networks

Two broad fields of distributing fluids under pressure in closed conduits interest the designer. The first and simpler field involves radial systems of pipe lines or ducts. Common examples are sprinkler systems and the usual water piping systems in residences. Radial systems resemble trees in structural form. The fluid is supplied through the main trunk, and diverges through successively smaller branches to the points of use along the branches or at their outermost limits. No connections exist across the branches beyond the points of divergence. Because the flow rate in any pipe line of the system is obvious when the discharge rates are known, a radial system may be studied without difficulty.

In contrast to radial systems, pipe line networks provide alternate paths for fluid flow. Examples of pipe line networks are ventilating systems in buildings and mines, municipal distribution systems for gas and water, and district and central heating steam distribution systems. In these systems the cross connections among the branches usually affect the distribution of flows and pressures. The flows, therefore, are not known and must be determined as part of the solution of the design problem.

Simplest Network Is Two Parallel Pipes

In designing a network, the engineer conceives a plan that appears feasible. He then analyzes the performance of the network, and uses the results of the analysis to suggest improved designs. To achieve the best combination of economy and physical performance, he should usually consider several alternate plans. By many methods of solution, each plan requires him to carry out a series of successive approximations to find the data desired concerning network performance. The work involved is often so great that he may prefer to base his designs upon incomplete information, rather than a thorough study.

The simplest type of network consists of two pipes in parallel. The

THE NONLINEAR ELECTRICAL ANALOGY process of pipe line network analysis permits the complete study of the steady-state performance of pipe line networks with a minimum of computational effort and of elapsed time. It is particularly attractive where comparisons are to be made among alternative methods of construction or operation, because only those readings need be taken which are of significance. Once the analyzer is set up to solve a particular problem, changes in operating conditions or of pipe line dimensions or arrangement can be made rapidly, and results can be compared in a few minutes. The process has been proved in analyzing systems for water, gas and steam distribution and for high velocity air flow. Several other fields of application remain to be investigated. A comparison among the various practical methods of analysis discussed in this article is presented in Table 1

solution of this problem is fairly easy, because the head loss along the two parallel paths of flow is identical. The Freeman graphical method, published in 1892, is often used for determining values of parallel flows or for slightly more complicated problems. The method is impractical when a network contains several loops.

The Hardy Cross Method

A significant stride in solving pipe line network problems was made when Professor Hardy Cross introduced his method of analysis in 1936 (Reference No. 1). The Hardy Cross method starts with an assumption of pipe line flow rates that balance at all junctions and that deliver the required discharges at all points of load. The friction head losses corresponding to these assumed flow rates are then computed for all pipes. The net unbalance in these losses for each loop is used to establish a correction in loop flow. The process is repeated for the corrected flows until an acceptable solution is reached.

A disadvantage of the Hardy Cross method is that the flow correction for each loop is found without reference to its effect on head losses in adjacent loops. Therefore, the corrections are likely to overcompensate in successive traverses, swinging back and forth in an annoying manner. Convergence may require many successive approximations, each of which involves a large number of computations. Each change in the conditions of a problem requires a new solution that usually involves corrections of flow and head loss for all pipe lines in the network. The method requires no investment in special equipment beyond a slide rule and some nomographs.

Linear-Approximation Method

A method of analyzing networks that greatly reduces the number of successive-approximation steps was published in 1949 (Reference No. 2). Called the linear-approximation method, it avoids the basic objection to the Hardy Cross method.

It begins with an assumed complete solution, including guessed values of flows and of friction head losses along all pipes — both sets of values being properly balanced.

TABLE 1 — COMPARISON OF METHODS of analyzing pipe line networks*

Method	Hardy Cross	Linear Approximation	Electrical Analogy	
			Linear	Nonlinear
Reference No.	1	2	3 - 9	10 - 12
Scope	Any Network	One to four loops	Any network within capacity of available analyzer	
Computational effort	Maximum	Intermediate	Intermediate	Negligible
Flexibility	Low	Low	Low	High
Time required to study first plan for a given network	Maximum	Intermediate	Intermediate	Low
Time required to study alternate plans	Maximum	Intermediate	Intermediate	Negligible
Investment in equipment	None	None	Intermediate	Maximum

*The preliminary work involved in preparing to make an analysis, including computation of pipe line head loss coefficients, is identical for all methods.

From corresponding values of flow and head loss for each pipe line, a head loss coefficient is computed and compared with the desired value as determined from the condition and dimensions of the pipe line. The solution procedure is thereafter direct, and is based on two fundamental ideas.

The first is that the relation between head loss and flow rate varies almost linearly for a significant range of flows on either side of an assumed flow rate. This approximation leads to the second fundamental idea, which is the use of ordinary linear algebra. The solution of a set of simultaneous linear algebraic equations, equal in number to the number of network loops, leads to flow corrections in all pipe lines. In a majority of problems, this first set of flow corrections provides an acceptable solution. If not, the second traverse is almost certain to give the final solution.

The disadvantages of the method are that it requires many mathematical steps, although usually markedly fewer than does the Hardy Cross method, and that the simultaneous equations may become cumbersome to solve. The natural field of use is for networks of one to four loops, but this field may be greatly extended by engineers who have access to machine methods of solving linear algebraic equations.

Hydraulic Model Methods

Several engineers, teachers and students have attempted to analyze pipe line networks by means of hydraulic models. So far as the writer is aware, these attempts have not justified general adoption of hydraulic model methods. Serious difficulties are the inconvenience of fitting pipes in a model, and of avoiding leaks. The measurement of flows in a large number of small pipes and loads is troublesome, and accuracy is affected by fittings.

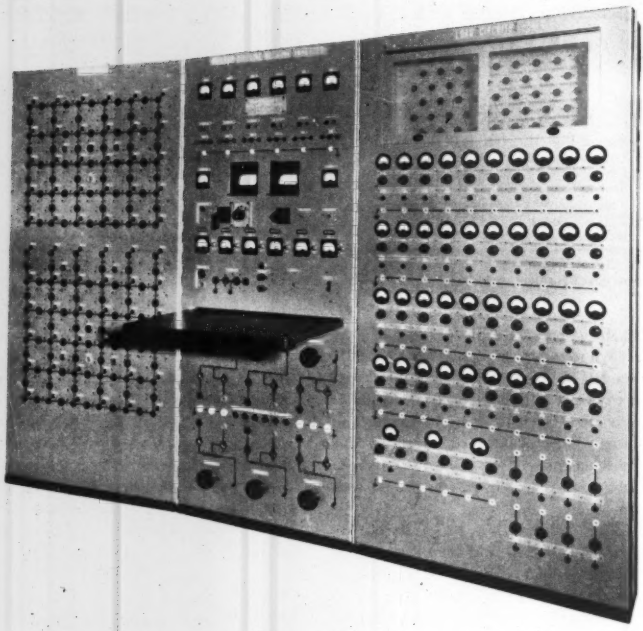
One investigator has used rubber tubes with pinch cocks in an experimental arrangement. Each pinch cock must be adjusted until measurements indicate that the proper relation between flow rate and head loss is achieved for each pipe line. It seems improbable that hydraulic models will be suitable for general use in analyzing pipe line networks.

Linear Electrical Analogy

The behavior of physical systems can often be studied by analogy with the performance of electric circuits. Examples include problems in vibration, heat flow, stresses in structures and surges in pipe lines. In 1934 T. R. Camp and H. L. Hazen (Reference No. 3) described an electrical-analogy method of analyzing flows and head losses in water distribution systems. In this analogy, electric current represents fluid flow, voltage drop represents friction head loss, generators represent fluid sources and resistors represent pipe lines and loads. Camp and Hazen adapted the power system electric calculating board at Massachusetts Institute of Technology to the study of flows and pressures in the water distribution system of Warwick, R.I.

The calculating board substituted an electrical successive-approximation method for the trial-and-error procedure on paper required by the Hardy Cross method. It had the advantage that corrections between successive traverses were always in the proper direction; hence, convergence was likely to occur within three or four traverses.

A serious defect of the use of a standard calculating board for this



THIS ELECTRIC PIPE LINE NETWORK ANALYZER at the Midwest Research Institute has a capacity of 104 pipe lines, six sources, 43 loads, 600 resistors

purpose is that ordinary linear resistors cannot automatically represent pipe lines, because the voltage drop across a linear resistor is proportional to the current through it. Friction loss along a pipe line, however, is nearly proportional to the square of the flow rate in the pipe. Since the flows in the pipes are not known, all resistors in the circuit must be set at estimated values of resistance for the first run. Currents and voltages as measured from this run do not — in general — correspond to the proper characteristic curves. The resistance values must then be changed and a new set of readings taken — the process being repeated until the required accuracy is achieved. Much computational work is involved in checking the comparisons between electrical conditions and pipe line characteristic curves and in determining the values of corrections for each traverse.

Applications of the Camp-Hazen method to the analysis of gas distribution systems have recently been published (References Nos. 4 and 5). Several alternate methods of using linear calculating boards for hydraulic studies have been published (References Nos. 6, 7 and 8), and a discussion of their use in steam problems awaits publication (Reference No. 9).

Nonlinear Electrical Analogy

Recognizing the shortcomings of the linear electrical-analogy method, Dr. Hazen inspired several other workers to search for a method of automatically representing pipe line performance by means of special nonlinear resistors. His continued interest in the problem led to the development of the nonlinear resistors now known as "Fluistors" that permit immediate determination of conditions in a proposed network without successive approximations. These resistors perform automatically in an electrical manner that is the direct analog of the characteristic of pipe lines, with accuracy suitable for most engineering purposes.

Before their properties are described, the relation between friction head loss and fluid flow in a pipe line should be discussed briefly.

Two important fields of pipe line network study exist, one in which fluid density is considered constant, and one in which the density varies. The first field includes the distribution of fluids such as water, oil, atmospheric air and low pressure gas. In this field, the relation between friction head loss, H, and flow rate, Q, is usually expressed empirically in the form

$$H = k_p Q^n \quad \text{.....[1]}$$

where n is a constant, usually taken as 1.85 or 2, and k_p is a head loss coefficient, the value of which depends on the condition and dimensions of the pipe line.

Since Equation 1 is nonlinear in form, its electrical analog should be expressed as

$$V = k I^n \quad \text{.....[2]}$$

where V is the voltage drop across a resistor, I is the current through it and k is a constant called the resistor coefficient.

The nonlinear resistors are designed to operate according to Equation 2, with $n = 1.85$. This value of n provides a direct analogy to the Hazen-Williams hydraulic formula and to certain formulas used in other fields of fluid flow. The resistors may also be used over a wide range of flows to represent formulas in which $n = 2$. They provide a close analogy to such square-law formulas if their coefficients are chosen so that the 1.85 power and the square-law formulas intersect at pressure drops corresponding to average conditions in the network under study. For those who prefer to use basic laws rather than empirical formulas, satisfactory representation of fluid flow characteristics can also be achieved readily by this means (Reference No. 10).

The second important field of application, involving compressible fluids, is treated as a modified analogy. The relation between absolute pressures, P_1 and P_2, at the inlet and outlet ends of a pipe line, and the weight flow rate, W, in the pipe, is usually expressed empirically in the form

$$P_1^{\alpha} - P_2^{\alpha} = k_f W^n \quad \text{.....(3)}$$

where α is a constant for a particular gas and range of pressures. For an approximately perfect gas, n is taken as 2, whereas for steam a good value is approximately 1.94. The value of n again varies, being 2 in the Weymouth high pressure gas formula and 1.85 in the Fritzsche steam formula.

The nonlinear resistors operate according to Equation 3 if the voltage V across each unit is considered

quantitatively analogous to the quantity

$$P_1^{\alpha} - P_2^{\alpha}$$

instead of to $P_1 - P_2$. In studies of compressible fluid, all measurements taken refer to the α powers of pressure. It is, therefore, necessary to find the α roots of these measured values in order to determine the values of absolute pressures. This one computational step is the only essential variation from the method used in analyzing networks of incompressible fluids.

Nonlinear Resistors and the Pipe Line Network Analyzer

The nonlinear resistors are comprised of tungsten filaments mounted in evacuated glass bulbs. In operation, the filaments usually glow, and have temperatures closely related to the pressure drops in the pipe lines they represent. Excessive pressure drops are indicated by bright filaments. The filaments reach steady-state temperature in a few seconds, and the accuracy of operation is not significantly affected by the proximity of other of the resistors or by the temperature of the surroundings. These nonlinear resistors are available in a series of coefficients, spaced at increments of approximately 5 percent, that provides an adequate range of values to represent the diameters and lengths of pipes found in most actual networks. The desired coefficient value is found by direct proportionality to the head loss coefficient, k_p, of the pipe line it represents, as described in various technical papers by the author.

To use these resistors effectively, a convenient means of mounting and interconnecting them and of controlling conditions at sources and loads is required. These facilities are furnished in the pipe line network analyzer illustrated, which is installed at the Midwest Research Institute, Kansas City, Mo. This unit is a commercial outgrowth of the original research unit developed at the School of Electrical Engineering at Cornell University. A stock of 600 resistors is available, with coefficients distributed according to a probability curve based on two years' experience with the analyzer at Cornell.

Loads are normally specified in terms of certain required flow rates, and the corresponding pressures available at points of use must be found from the analysis. In the analyzer, therefore, load currents must be maintained at specified values regardless of the voltages present. This result may be achieved semi-automatically by means of current regulating ballast lamps or fully automatically by means of electronic circuits.

Pressure drops, or differences in α powers of pressure, are read directly from the analyzer without conversion from voltage values, from special demountable scales applied to the master voltmeter. Flow rates are indicated directly from demountable scales on the master ammeter. Pressure drops around loops and flow rates at pipe line junctions automatically balance, subject to small errors in the third decimal place. The overall error in pressure drops found from analyses averages from 0.5 to 3 percent, always on the side of excess drop. This error is caused chiefly by interconnecting wires and contacts.

The effects of pipe line fittings, velocity head and altitude head must sometimes be considered in an analysis. When the losses caused by fittings can be expressed in terms of equivalent lengths of pipe, they can readily be accounted for in the analyzer. Velocity head and altitude head are ignored during an analysis. Simple additive corrections, according to Bernoulli's theorem, may be made to find the static pressure at any point after the analysis has been conducted.

Where Analyzers Are Available

At present, pipe line network analyzers employing these nonlinear resistors are available at:

Cornell University, Ithaca, N. Y.: capacity 133 pipe lines, three sources, 18 loads, 250 resistors. Installed September 1949.

State College of Washington, Pullman: capacity 99 pipe lines, three sources, 16 loads, 600 resistors. Installed May 1951.

Midwest Research Institute, Kansas City, Mo.: capacity 104 pipe lines, six sources, 43 loads, 600 resistors. Installed April 1952.

For special problems, the source and load capacities of all these analyzers may be extended somewhat, and each is designed with a view to possible future enlargement.

References Cited in Text

1) Cross, Hardy. Analysis of Flow in Networks of Conduits or Conductors. Bul. 286, Univ. of Illinois Eng. Exp. Sta., Urbana, Ill. (1936).

2) McIlroy, M. S. Pipe Line Network Flow Analysis Using Ordinary Algebra. Jour. AWWA, 41: 422 (May 1949).

3) Camp, T. R., and Hazen, H. L. Hydraulic Analysis of Water Distribution Systems by Means of an Electric Network Analyzer, Jour. NEWWA, 48: 383 (Dec. 1934).

4) Clennon, J. P. Calculators Solve Flow Problems. AGA Monthly 23: 19 (Oct. 1951).

5) New Electric Calculator Solves Flow Problems. Heating, Piping & Air Conditioning 23: 87 (Dec. 1951).

6) Perry, H. A., Jr., Vierling, D. D., and Koehler, R. W. Network Flow Analysis Speeded by Modified Electrical Analogy. Eng. News-Rec., 143; 12: 19 (Sept. 22, 1949).

7) Suryaprakasam, M. V., Reid, G. W., and Geyer, J. C. Use of Alternating Current Network Calculator in Distribution System Design. Jour. AWWA, 42: 1154 (Dec. 1950).

8) Haupt, L. M. Solution of Hydraulic Flow Distribution Problems Through Use of the Network Calculator. Texas Eng. Exp. Sta. Research Report No. 18, College Sta., Texas (Sept. 1950).

9) Hatfield, H. F. and Swoyer, R. H. Use of the D-C Calculating Table for the Determination of Pressure Gradients in District Steam Systems. Presented at NDHA annual meeting, June 1951. To be published in NDHA Proceedings.

10) McIlroy, M. S. Direct Reading Electric Analyzer for Pipe Line Networks. Jour. AWWA, 42: 347 (April, 1950). See page 362.

11) McIlroy, M. S. Gas Pipe Networks Analyzed by Direct Reading Electric Analog Computer. Presented at AGA Distribution Conference, April 10, 1952.

12) McIlroy, M. S., and Chow, C. K. Steam Distribution Systems Analyzed by Nonlinear Electrical Analogy Method. Presented at NDHA annual meeting, June 1952.

[Photo courtesy The Standard Electric Time Co.]

"Greatest Era" Dawns

The heating, piping and air conditioning industry is "at the threshold of its greatest and most prosperous era", according to a speaker at the opening session of the HPACCNA's 63rd annual convention, held in Boston last month

THE HEATING, PIPING and air conditioning industry is at the threshold of the "greatest and most prosperous era in its history", said Howard L. Spindler, vice president, American Radiator and Standard Sanitary Corp., in his talk on new sales horizons at the opening session of last month's 63rd annual convention of the Heating, Piping and Air Conditioning Contractors National Association, in Boston.

After citing the tremendous amount of construction undertaken during the last few years, he said there is still great need for new buildings of many types, such as hospitals, schools, hotels, etc., and emphasized that a high level of construction will probably continue for some years. HPACCNA members have a great opportunity to sell modern heating systems for both new construction and for modernization.

He pointed out that many believe the next major development to "take the country by storm" will be year around air conditioning for homes and virtually all types of buildings. In his opinion, it will not be too many years before people will simply refuse to work where temperatures are permitted to range up to 90 and 95 deg. Moreover, every new or additional air conditioning installation puts pressure on those who own or manage non-air conditioned buildings which must compete with newly built or modernized structures.

In discussing research and technological innovations, Dr. J. R. Killian, Jr., president of Massachusetts Institute of Technology, traced the development of industrial research and said we are approaching a new era in regard to automatic control of industrial processes.

Pleading for close relationship between education and industry, Dr. Killian said that research grants are enabling schools and universities to survive inflation but basic research must be allowed to continue. At the present time, he said, 95 percent of the research dollar is going into development and not enough into fundamental research — despite the fact that the total amount of money spent for research has increased 10 times in the last 20 years.

Each year, the HPACCNA presents a distinguished service award to one of its members. Arnold H. Goelz is the recipient this year; the award was presented by President Harold E. McGregor in recognition of his "outstanding work in connection with the association's pipefitter-apprenticeship training program."

Overhead Survey in Progress

Chairman Herman W. Goldner, of the committee on trade promotion, reported that an overhead survey is in process, and gave preliminary figures from 212 members in 28 states. Some of the total annual figures given for these 212 firms (about one-sixth of the total membership) are:

Net worth	$ 37,750,000
Sales volume	$199,383,000
Operating expenses	$ 22,780,000
Production payrolls	$ 52,554,000
Average ratio of sales volume to net worth	5.21
Average ratio of operating expenses to total sales	12.1%

Based on this preliminary report, the total annual volume of business done by HPACCNA members is approximately $1¼ billion and purchases of material and equipment are about $600 million annually.

Martin P. Durkin, president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry said that collective bargaining is working well in the pipefitting fields, and recommended formation of a national joint trade promotion committee to be made up of representatives of the HPACCNA, the National Association of Master Plumbers, and the UA. The function of the committee would be to promote the industry in various ways, particularly in getting piping and mechanical work placed in the contracts "which rightfully belong" to piping and plumbing contractors. Another purpose would be to prevent jurisdictional disputes. The national committee would obtain information and distribute promotional and educational literature to similar committees formed at the local level. Efforts of the local committees would be directed toward engineers, industrial firms, architects, government agencies, hospitals, schools, and the general public; and the local committees — backed up and helped by the national committee — would tell the story of what the industry has to offer.

Standards on Panel Heating, Snow Melting

In his report on the activities of the HPACCNA radiant panel heating committee, Chairman Peter B. Gordon indicated that the most important activity during the year was the work done on the new part of the engineering standards which will be devoted to radiant panel heating and

snow melting. This work is expected to be completed next year and the new section of the standards will include a general discussion of the workings of these systems, methods of operation, construction of panels, data on load calculation and panel outputs, coil arrangement and spacing, piping and distribution systems, venting and draining details and selection of equipment.

It is intended that the calculating methods to be included will be kept as simple as possible without sacrificing overall flexibility and adaptability. Mr. Gordon also described — very briefly — the research activities of the American Society of Heating and Ventilating Engineers in connection with panel heating and cooling. The HPACCNA has been contributing about 4 to 5 percent of the money obtained from industry for this ASHVE program and he suggested that the association and individual members could do more, as they have an important stake in this activity.

Next on the agenda was the report of the committee on air conditioning, by Chairman W. S. Bodinus. He emphasized that association members are doing a great deal of air conditioning work at this time.

As chairman of the refrigeration committee, Austin S. Ford reported that the work of his group had been primarily concerned with obtaining reliable ratings. He said that the new refrigeration standards and revisions of standards of the American Society of Refrigerating Engineers have been carefully thought out from the standpoint of the user. The committee is working on a new pamphlet, which will explain the basic fundamentals of refrigeration, for use by journeymen and contractors.

The outlook in the construction industry was discussed by Norman P. Mason, a lumber dealer and a member of the board of directors of the Chamber of Commerce of the United States. In his opinion, present business conditions "are ideal from the standpoint of government planners" — full employment, no shortages, price stability, and a diminishing need for tight controls. He said that planners "like controls, but not tight ones, for they are hard to administer."

He believes that construction this year will be at the same level as last year. His reasons include availability of mortgage money through conventional channels and the still existing pent-up demand for buildings of virtually-all types. The people of this country have the need, the desire and the money to support a large amount of construction. The extent to which this is translated into actual building depends on how well the construction industry reduces costs, improves styles and utility of buildings and how well it sells its wares, he said.

Apprenticeship Program Doing Well

In the absence of Chairman J. J. Hanighen, Jr., the report of the apprenticeship committee was given by Arnold H. Goelz. The results of a questionnaire on the apprenticeship programs operating in the country indicate their healthy condition. However, it was reported that much remains to be done in furthering the programs and the committee is preparing a pamphlet setting forth the merits of apprenticeship in the industry.

Rowland Tompkins, as the association's representative on the American Standards Association council, reported that several ASA standards had been approved during the year.

He also said that ASA project A13, Scheme for the Identification of Piping Systems, has been transferred to the safety code correlating committee, and that Project Z56 represents the formation of a committee for the development of model laws and ordinances (including constitutional provisions) which, through adoption, would enable states and local jurisdictions to effectuate the use and proper administration of nationally recognized standards and codes. A committee has also been formed (Project B32) to develop a standard for wire diameters and metal thicknesses which applies not only to sheets but also to plates, strips and to wall thicknesses of piping, tubing and casing.

[Our report of this convention will conclude in a succeeding issue.]

HOT RADIOGRAPHY SAVES PIPING INSTALLATION TIME

THE TECHNIQUE OF "hot radiography" permits the taking of X-ray photographs of large pipes, valves, and similar units at temperatures as high as 1200 F. This process has been applied with considerable success to the inspection of partially completed welds on hot sections of pipe to check for possible welding defects.

Because hot radiography can be accomplished at elevated temperatures, the method eliminates several time-consuming steps. It makes it practical to interrupt the welding operation to inspect the weld root, where most flaws occur. This technique, therefore, saves the many man-hours of heating and controlled cooling that would otherwise be required before the weld could be inspected. Additional time is saved because, if defects are found, it is necessary to chip away only a partially-completed weld, rather than a finished weld.

As an example of the time saved by the hot radiography process, welding time on comparable sections of pipe at a large eastern power plant was reduced from nine days to less than three days when the work was inspected by the new process. The technique can also be used for radiography of other forms of hot metallic materials. [Photo courtesy Sam Tour & Co., Inc.]

THIS SPECIAL film holder permits the inspection of partially-completed welds by radiography while the metal is hot. A cooling fluid, circulating through the hollow chambers of the holder, protects the film emulsion from the heat of the welded section

Application Methods for Mineral Wool Pipe Insulation

HARRY E. LEWIS, Executive Director, and Charles E. Young, Chairman, Specifications Committee, of the Industrial Mineral Wool Institute, **explain the methods of applying the various types of mineral wool insulation to heated piping and illustrate the comments with sketches. Tables give the thicknesses of molded type insulation and recommended minimum thicknesses**

THE SPECIFICATION OF insulating materials and application methods is governed by the physical and operating characteristics of the particular heated equipment or surface to be insulated. The most common type of equipment requiring insulation is piping — carrying water, steam, gas, oil, chemicals and other materials. Pipe insulation contributes in large proportion to the efficiency of a system and therefore is of direct concern to the engineers and contractors who design, install, operate and maintain piping services.

The four particular conditions which must first be considered in specifying insulation on a given pipe line are (1) temperature of the pipe contents, (2) outside diameter of the pipe, (3) location of the pipe (indoors or outdoors) and (4) degree of exposure to external damage. These conditions are most common; among others are orientation of piping (horizontal, vertical or diagonal), exposure to moisture, and vibration.

Two Common Types of Insulation

There are two common types of mineral wool pipe insulation, *blanket* and *molded*. Blanket type pipe insulation is mineral wool reinforced on one or both sides by a suitable confining material and bound to form a nonrigid insulating section. Designed and manufactured to have both maximum flexibility and high thermal efficiency, it is produced in sizes to fit piping from 2 in. diameter and up. The most common confining materials used are either metal lath or wire netting, both of which are secured by wire or cord ties through the mineral wool itself. Blanket type pipe insulation is commercially manufactured in 24 in. long single layer sections, 1 in. to 4 in. thick, for standard pipe sizes. Standard blankets are selected having dimensions which will assure a snug fit to the pipe at specified insulation thicknesses.

Molded type mineral wool pipe insulation consists of mineral wool combined with bonding ingredients to form a rigid insulation. This type of pipe insulation combines rigidity and strength with good insulating characteristics and is shaped to be particularly easy to install. Molded pipe insulation is manufactured in single and double layer thicknesses. Each section is 36 in. long, a standard length found generally most useful. To insulate small diameter piping, molded type mineral wool is supplied in sections (half cylinders), which are fitted together over the pipe. For larger pipe sizes, molded type insulation is manufactured in segments (usually four). The manufacturer maintains a tolerance of $\frac{1}{16}$ in. for all dimensions so that it will fit tightly.

TABLE 1—MOLDED TYPE pipe insulation—thickness[a] for standard-weight steel pipe sizes

Pipe size, in. Nominal	Actual OD	Standard thickness	Double standard thickness
½	0.840	⅞	1¾
¾	1.050	⅞	1¾
1	1.315	⅞	1¾
1¼	1.660	⅞	1¾
1½	1.900	⅞	1¾
2	2.375	1½	2⅛
2½	2.875	1½	2⅛
3	3.500	1½	2⅛
3½	4.000	1½	2⅛
4	4.500	1⅛	2¼
4½ [b]	5.000	1⅛	2¼
5	5.563	1⅛	2¼
6	6.625	1⅛	2¼
7 [b]	7.625	1¼	2½
8	8.625	1¼	2½
9 [b]	9.625	1¼	2½
10	10.750	1¼	2½
11 [b]	11.750	1¼	2½
12	12.750	1½	3
14 and up	———	1½	3

[a] In addition to the thicknesses specified above, molded type pipe insulation may be manufactured in thicknesses of 1, 1½, 2, 2½, 3 and 4 in. for all nominal pipe sizes.

[b] These pipe sizes are not listed as standard for steel pipe in Simplified Practice Recommendation R57-32, Wrought Iron and Wrought Steel Pipe, Valves and Fittings.

In order to facilitate specification, standard and double standard thicknesses of molded type pipe insulation for standard-weight steel pipe have been set forth by the industry. [see Commercial Standard CS117-49, "Mineral Wool Insulation for Heated Industrial Equipment".] Table 1 gives these thicknesses for nominal pipe sizes from ½ to 14 in. and up. Molded type pipe insulation may also be manufactured in 1, 1½, 2, 2½, 3 and 4 in. thicknesses for all nominal pipe sizes given in the table.

On large piping, usually 14 in. in diameter and up, it is often very satisfactory to apply mineral wool insulating cement, particularly where irregular surfaces are encountered in combination with the piping. The insulation thickness required by pipe temperature is built up on the pipe in separate layers. It is recommended that each layer be no thicker than ¾ in. Each layer should be allowed to dry thoroughly before the application of further insulating cement.

More heat will be saved on any pipe line if the thickness of the insulation is increased; however, the cost of insulation per foot of piping also increases. There is, therefore, an economic thickness of insulation which will result in maximum heat savings per dollar of cost. Table 2 gives recommended minimum insula-

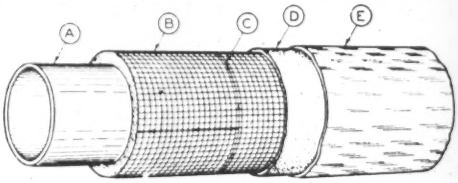


FIG. 1—HOW BLANKET type mineral wool insulation is applied. A, bare pipe; B, blanket mineral wool wrapped circumferentially around bare pipe; C, joints secured with No. 16 ga galvanized wires; D, insulating cement; E, asphaltic or other specified finish

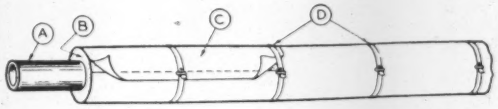


FIG. 2—SINGLE LAYER METHOD of applying molded insulation. A, bare pipe; B, sectional mineral wool pipe insulation; C, canvas jacket or other specified finish; D, metal bands

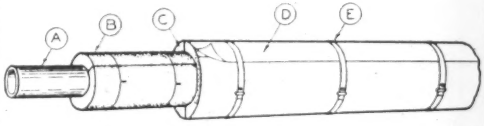


FIG. 3—DOUBLE LAYER APPLICATION of molded pipe insulation. A, bare pipe; B, first layer secured with No. 16 ga galvanized wires; C, second layer applied with all joints staggered; D, canvas jacket or other specified finish; E, metal bands

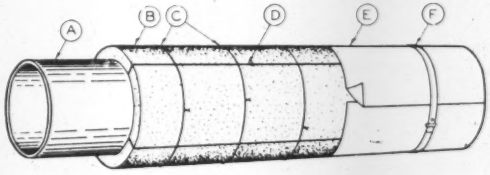


FIG. 4—SEGMENTAL MOLDED insulation is applied similarly to sectional insulation. A, bare pipe; B, segmental pipe insulation; C, No. 16 ga galvanized wires; D, insulating cement, when required; E, canvas jacket or other specified finish; F, metal bands

tion thicknesses for blanket type pipe insulation, 150 F to 1200 F, and molded type pipe insulation, from below 275 F to 600 F. For each type of pipe insulation, the recommended minimum thicknesses are given for three ranges of pipe diameter. Note that the data for molded type pipe insulation refer to the standard and double standard insulation thicknesses given in Table 1.

The thicknesses in Table 2 are recommended for indoor applications. When piping is located outdoors, it is recommended that the insulation thickness be increased not less than ½ in. Because earth is of some insulating value, the thickness may be decreased ½ in. when piping is installed underground.

Applying Blanket Type Pipe Insulation

Usually applied on straight piping and long radius bends of 2 in. standard pipe size or larger, blanket type pipe insulation (Fig. 1) is first wrapped circumferentially around the bare pipe. The longitudinal edges are then secured by tying or lacing with 16 ga galvanized soft iron wire, preferably on the underside of the piping. The mineral wool blanket sections are tightly butted together on the pipe to provide an unbroken insulation covering.

The materials and method for finishing blanket type insulation depend upon whether it is located indoors or outdoors. Generally accepted materials for finishing insulation on indoor piping include mineral wool insulating cement, roofing felt, asphaltic mastic or emulsion and canvas. Insulating cement is applied over the blanket type insulation in two ¼ in. layers. The first layer is trowelled on and allowed to dry before the second is applied. As the second alternative finish, asphalt saturated roofing felt is wrapped around the piping, lapped at least 2 in. and often sealed with an asphaltic compound or lap cement. Roofing felt should be securely held over the pipe with copper wire or galvanized iron bands spaced on approximately 6 in. centers along the pipe.

To apply an asphaltic finish to indoor piping covered with blanket type pipe insulation, a ¼ in. layer of mineral wool insulating cement is first applied and, when dry, is covered with 1 in. galvanized wire netting stretched over the surface and tightly wired in place. Asphaltic mastic or emulsion is then trowelled into the wire netting to provide a ⅛ in. dry thickness (or about ¼ in. when wet). As a base for a canvas pipe jacket, a layer of flameproof paper, 1/16 in. thick asbestos paper or a ¼ in. layer of insulating cement is first applied. The canvas jacket

TABLE 2—RECOMMENDED MINIMUM insulation thicknesses for mineral wool pipe insulation

Blanket type				Molded type			
	Thickness, in.				Thickness, in.		
Temperature, F	Pipes 2 in. to 4 in.	Pipes 4 in. to 6 in.	Pipes 6 in. and up	Temperature, F	Pipes below 2 in.	Pipes 2 in. to 4 in.	Pipes 4 in. and up
150 to 250	1	1	1	Up to 275	Std.	Std.	Std.
250 to 350	1	1	1	275 to 350	Std.	Std.	1½
350 to 450	1	1	1½	350 to 425	Std.	1½	2
450 to 550	1	1½	1½	425 to 500	1½	2	Dbl. std.
550 to 650	1½	1½	2	500 to 600	2	Dbl. std.	Dbl. std.
650 to 750	1½	2	2				
750 to 900	2	2	2½				
900 to 1,050	2	2½	3				
1,050 to 1,200	2½	3½	4				

is then sewn or pasted over the base material. To insure a tight cover on a sewn canvas jacket, the stitches should be spaced at no more than 1/3 in. intervals along the pipe.

When blanket type pipe insulation covers piping located either outdoors or exposed to moisture or accidental damage, it is usually finished and weatherproofed by sheet metal jackets, roofing felt or an asphalt compound. A sheet metal jacket should be at least 28 ga. single or double galvanized. The seams are lapped downward against the weather and secured with galvanized metal bands, 1/2 in. wide or greater, which are machine-stretched and crimped. It is not recommended that the bands be spaced at much more than 6 in. centers along the pipe.

The roofing felt finish is applied in the same manner outdoors as described above for indoor locations. To avoid the possibility of wetting the insulation, it is very important to lap the roofing felt downward. An asphaltic finish is applied in the same manner outdoors as in indoors, making certain that the asphaltic coat is sufficiently thick and even at all points.

Application of Molded Type Pipe Insulation

The single and double layer methods of applying sectional molded type pipe insulation are illustrated in Figs. 2 and 3. In Fig. 2, single layer sectional insulation is placed over the piping, with all sections tightly butted together, and is covered with a canvas jacket and banded in place. Double layer application of sectional pipe insulation in Fig. 3 requires that the first layer be secured in place with loops of wires placed on approximately 8 in. centers. The second layer is tightly fitted directly over the first layer with all joints staggered to avoid aligning edges. As with the single layer application, a canvas jacket (or other finish) and metal bands follow.

Application of segmental molded type pipe insulation in Fig. 4 is similar to the procedure followed with sectional insulation. Although Fig. 4 shows a single layer method, double layer segmental pipe insulation can also be obtained. On such large diameter piping, mineral wool insulating cement is often trowelled over the installed segments before applying the canvas jacket or other finish.

A canvas jacket is a most satisfactory finish for molded type pipe insulation located indoors and not exposed to moisture or abrasion. The canvas jacket is drawn tightly over the pipe and smoothly pasted at all lapping edges. The metal bands should be secured over the canvas at both the center and ends of each length of insulation. When factory-weight canvas is specified, insulation and canvas are supplied as a unit.

Molded type pipe insulation installed on outdoor piping or in locations where accidental damage or wetting might occur is finished in one of the ways recommended for blanket type pipe insulation under similar conditions. All four finishing methods are excellent, the finish most appropriate for particular conditions being selected.

HOW WE OVERCAME FLOW OBSTRUCTION

By Carl A. Ramstad, Scott Paper Co.

THE USE OF AN orifice for the measurement of the flow of sulphite waste liquor presented the possibility of obstruction due to solid matter carried along the bottom of the pipe. At the same time, the small percentage of fiber in the liquor would probably build up around the edge and cause a false differential.

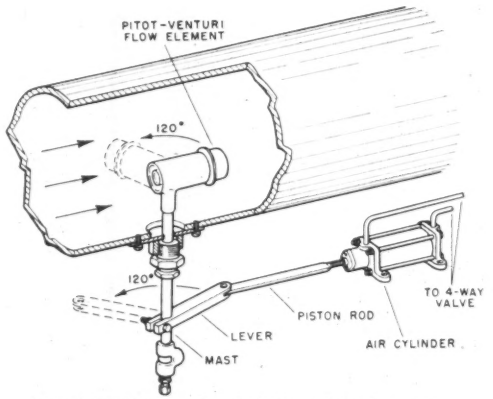
Therefore, to obtain an accurate flow measurement, a pitot-venturi device connected to a flow meter was decided upon. A water purge was connected to each line.

It was soon learned that the purges were insufficient to keep the head clean and that incorrect values were being given.

An experiment, which turned out to be satisfactory, was decided on.

The plant salvage department provided a small air cylinder with which a sliding stem four-way air valve had been used. The cylinder was suspended from a bracket so that the piston travel was at right angles to the mast of the pitot-venturi. The piston rod was connected to a lever fastened to the mast and long enough to provide an angle of rotation of about 120 deg. When air was applied to the back side of the piston, the head was turned far enough to flush fiber off, and thus give an accurate reading.

To make the device automatic, a time switch was used to energize a solenoid operated valve. This provided an output to a small diaphragm motor mounted on the four-way valve which, in turn, determined which direction the piston should travel. The timer was set to close the circuit for about 40 or 50 sec every 15 min. This reversed the pressure to the cylinder and turned the head automatically.



THIS SCHEME is used to flush fiber off the flow element in a sulphite waste liquor line. A time switch energizing a solenoid operated air valve makes the device automatic

The reading is in error as long as the head is turned, but the percentage of error in point of time is quite small. [Reproduced from "Taylor Technology" through the courtesy of Taylor Instrument Cos.]

When To Bank Checks Marked "Payment in Full"

THERE ARE TIMES when checks marked "payment in full" for sums which do not cover the amount due may be safely banked to your credit. The following true story, with names disguised, helps in distinguishing the "when" and "when not".

Tempo Piping & Heating Corp. did an extensive job for Estate Buildings, Inc., and affiliate companies. Things went along smoothly except for a difference of opinion concerning the small sum of $9.20 which arose in the course of the work. This difference was amicably settled by Tempo, who removed the charge.

Upon receipt of Tempo's bills for balances due, Estate Buildings sent a letter to Tempo reading substantially as follows:

"Enclosed herewith find checks" — naming sums for account of itself and affiliates — "in full settlement of all your bills to date." The accompanying checks were marked accordingly, "in full settlement."

Tempo was surprised, because the checks failed to meet the total charges by some $1000. However, Tempo deposited the checks in the bank and advised Estate in writing:

"We do not consider your checks as full payment. They have been applied on your account. . . There has never been any dispute other than $9.20, for which we gave you credit."

Estate Buildings did not share this view, so Tempo brought suit for the claimed discrepancy. Estate and its co-defendants leaned heavily on a previous court decision, which said that one who received a check sent "in full payment" of a disputed claim must either accept it on the conditions under which it was sent, or return it. The recipient is not permitted to keep the check and impose other conditions, the defendants contended.

Estate pointed out that Tempo's *use* of the checks involved *acceptance of the condition*, in spite of the fact that Tempo wrote a letter saying the checks were accepted merely as payment on account.

There Must Be a Dispute to Settle One

The trouble with this view, said the court (in effect), is fundamental: The previous decisions cited by Estate were all in reference to a *dispute*. Where there's *no dispute* there can be no *accord and satisfaction* of a claim. In support of this dictum, the court cited a large number of prior opinions. Particularly pertinent was one by a notably learned judge:

"Two forms of accord and satisfaction of an unliquidated claim" are to be distinguished. "One is when there is a true assent to the acceptance of a payment in *compromise of a dispute*, or an *extinguishment of a liability uncertain* . . . The other is when the tender of the payment has been coupled with a condition whereby the use of the money would be wrongful if the condition is ignored. What is said is over-ridden by what is done, and assent is imputed as a matter of law."

The court in the Tempo case made clear a rule that has grown up in connection with the satisfaction of unliquidated demands: He "who sends a check to another upon a *condition explicitly declared*, that the demand shall be extinguished or the check sent back unused, may hold the creditor to the condition, however embarrassing the choice. The use of the check under such circumstances and in violation of the condition would be 'an act of conversion'.

"However," the court hastened to add, "unless there exists a *genuine controversy* concerning the amount due, mere payment by one party of a sum less than the whole claim and the acceptance of that sum by the other party do not 'erect a foundation for such a settlement as may be deemed an accord and satisfaction.'"

An indispensable element of accord and satisfaction is, therefore, actual and substantial *difference of opinion*, expressed previous to the payment and thus inviting discussion for adjustment. The court cited a previous decision as showing that there must be a bona fide concession by one of the parties, an admission that the claim is correspondingly without merit.

Where the liability of the debtor is not "in good faith disputed", the acceptance of a less sum than is the creditor's "total due" will not of itself discharge the debt, because the element of consideration is lacking and because the debtor's obligation to pay the entire debt is not satisfied.

While the law favors adjustment of controversies without judicial intervention, it will not permit a creditor to accept and retain money which has been tendered by way of compromise in a bona fide agreement, and then successfully sue his debtor for recovery of a greater sum.

In a word, said the court, a "demand is not liquidated until it appears how much is due". The Tempo-Estate litigation lacked the genuine *dispute* element necessary to fix the due amount.

Consequently, judgments in favor of Tempo against Estate and affiliates were rendered for substantial amounts. Nevertheless, *if* there had been a compromised difference of opinion, Tempo's acceptance of the checks apparently would have constituted accord and satisfaction in full and Tempo could not have obtained any further sums through the courts.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

William Hurd Hillyer, author of this article, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

QUESTION OF THE MONTH

Using Doorway Air Curtains To Keep Flies Out

ONE OF HPAC'S READERS asked a question, which was published recently, about keeping flies out of a restaurant kitchen by means of an "air curtain" over a doorway.

Several years ago, we were called in on a job where a manufacturer of oleomargarine was having difficulty in preventing flies from entering open doorways. He wanted to keep the doors open, in order that small industrial electric trucks could travel from one room to another without the driver having to stop his machine in order to open and close the doors. In fact, the flies took advantage of the opportunity to gain access to storage rooms when the doors were opened.

After careful consideration and discussion with several other interested parties, it was finally decided to install a centrifugal fan with duct work and a properly shaped diffuser to spread a thin sheet of air over the doorway.

The first installation proved extremely successful, and led to similar systems for all other interior doorways. This first installation was made at the Standard Margarine Co., Indianapolis, in 1946, and has given continuous satisfactory results.

Since then, we have engineered many jobs of this type for various applications — including bakeries, creameries, packing plants, restaurant kitchens and general offices.

The actual installation consists of a direct connected centrifugal fan above the doorway. It is necessary to install the fan at least 3 ft from the top of the doorway, in order to make allowance for a sheet metal diffuser.

The fan may be bracketed to the wall, or installed on a platform. In any case, the discharge must be down vertically, preferably with the outlet away from the wall, instead of along the wall.

The fan size is determined by the width of the doorway, height of doorway, and whether the door is inside or outside.

Generally, the air is recirculated through the fan; however, outside air may be used if preferred.

A sheet metal diffuser connects the fan outlet with a slotted opening directly above the doorway. The success of the system depends on the proper construction of the diffuser and slotted opening, which is adjustable in order to increase or decrease the air velocity, as well as to adjust the angle of air dispersement.

For inside rooms, we use a 1200 fpm outlet velocity, and for outside doors 2000 to 2400 fpm. The static pressure generally is ¼ in., although it may increase due to design conditions. We also recommend a 6 in. overhang on each side of the door, which can be reduced to 3 or 4 in. where required due to the building construction. A 2½ in. slot is recommended regardless of the width of the door.

Several years ago, we were called in on a rather unusual job. The general offices of a utility company in a small southern Indiana city had just completed a remodeling program, which included the installation of a pair of all-glass swinging doors, which presumably were the first of their type in that city.

In a short time, many complaints were received by people who came in to pay their utility bills, and — not recognizing the glass doors — walked into them. Since the management was reluctant to install screen doors, they decided on an air curtain to prevent flies and other insects from entering. The installation was made, and proved successful. Our latest report is that while the management has now educated the public about the glass doors, they still use the air curtain during warm weather to allow freedom of passage. — JOE H. NIESSE, Ilg Electric Ventilating Co.

CONTROLLING SMOKE DURING STOKER OFF-PERIODS

THE PROBLEM OF controlling smoke during off-period or stoker idling periods is a rather frequent one and it can be solved. However, there is not enough information in the reader's question published in the April HPAC to intelligently analyze the situation.

From the information submitted, it is apparent that the 48 in. setting height is probably partly responsible. A 150 hp boiler should be fired at at least 1000 lb per hr of coal, which would require somewhat higher setting height according to the Stoker Manufacturer's Association. If the firing rate is 1000 lb, it is apparent that the burning rate per square foot of grate is higher than it should be to overcome this particular problem.

As there is no information regarding stack height, it is difficult to determine what the draft condition is. But with three boilers on the same stack, unless proper automatic draft control is provided, this problem cannot be overcome. The draft for these boilers should be controlled at the individual uptake dampers. An overfire air system would definitely help overcome this situation and would be required in most cities where smoke is controlled.

I assume that the installation has the proper overfire air; however, if not, this may overcome the difficulty. —HOWARD J. SCOTT, Chief, Bureau of Smoke Abatement, Cleveland.

SUPPLY SOME OVERFIRE AIR

REFERRING TO THE question in April on stoker operation, the stoker stops and the blower supplying air turns off at the same time — but enough air sneaks through the windbox and tuyeres by natural draft to partially burn the green coal left in the retort. Since the blower is off, the gases rising from the fuel bed do not come into contact with enough oxygen for complete and smokeless combustion.

The smoking and incomplete combustion may be reduced by supplying

a little overfire air. This might be done only when the stoker is off or it might be supplied all the time. If overfire air is supplied continuously, less smoke will be produced when picking up load and building up the fuel bed.

I would like to suggest that the depth of the fuel bed be checked — perhaps it is deeper than it need be. A good rule of thumb for normal operation is to have the depth of the fuel bed equal to the width of the windbox.—FREDERICK B. MORSE, Consulting Mechanical Engineer.

SEVEN QUESTIONS ON DUCTS AND GRILLES

A MECHANICAL ENGINEER asked several questions regarding air flow and duct design, which were published in the March Question of the Month pages:

"The duct sketched is designed by the 'equal friction' method, so that the friction loss per foot is constant throughout its length, for the volumes of air flow indicated.

"By 'normal pressure', I mean pressure normal to the face of a grille or other opening provided for letting air out of a duct. This may be the static pressure in the duct, the total pressure in the duct, or the static pressure plus a part of the velocity pressure, depending upon how much of the velocity pressure is utilized in pushing the air out of the opening.

"*Question No.* 1—Must opening *A* be of a definite size, for 200 cfm, a variation from which would cause more or less than 200 cfm to flow out of it, and *less* or *more* than 800 cfm to flow in the second section of duct?

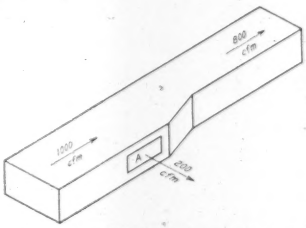
"*Question No.* 2—Upon the sudden 90 deg change in direction of the 200-cfm-portion of air coming out of the opening, is all of the velocity pressure it had when flowing in the first section of the duct, lost in the shock of the directional change?

"*Question No.* 3—Is any of its former velocity pressure recovered so as to increase the pressure behind the opening (normal pressure), as would be the case if the air had been turned by means of an elbow or other turning device?

"*Question No.* 4—If any of its former velocity pressure is recovered, what percent (approximately)?

"*Question No.* 5—Is the velocity pressure in the air stream, just outside of the opening, equal to the normal pressure inside the opening minus the friction loss through the opening?

"*Question No.* 6—Is this friction loss relatively small, or, in other



SEVEN QUESTIONS about air flow in this duct and from the outlet are asked by a mechanical engineer and are commented on by several readers in reply

words, is the normal pressure inside almost entirely converted into velocity pressure when the air flows out of the opening?

"*Question No.* 7—In manufacturers' grille selection tables, a certain 'pressure required behind the grille' is given for a certain size of grille, a certain volume of air flow through the grille, and a certain throw. Must this pressure, as given in the tables, be the same as that which actually exists in the duct behind the grille (normal to the face of the grille) to get the volume of flow and throw from that particular grille, as shown in the tables?"

Several of HPAC's readers have prepared answers (some of which were published in the May issue):

DISCHARGE VELOCITY FUNCTION OF AIR STREAM ENERGY

CONCERNING THE questions on air flow asked on page 107 of the March HPAC, I would offer the following answers:

Question No. 1—Opening *A* must be of a definite size for a given volume discharged, with given pressures in the main. This is evident when it is considered that the velocity of discharge is a function of the energy in the main air stream. Since this energy will remain constant for any volume of discharge and since the volume is a function only of velocity and area, $Q = AV$, then the size of the opening must determine volume of discharge.

Questions Nos. 2 and 3—In my experiments on rather high velocity ducts handling air at approximately 5000 fpm discharging through ungrilled openings in the side of the duct, it was obvious that the discharge velocity was the vector sum of the velocity pressure and static pressure in the duct minus certain losses. In other words, the air would not make a sudden 90 deg change in direction but a change that could be predicted vectorially.

Question No. 6—The friction loss through the opening can be roughly predicted from calculations based on orifice losses.—I. A. NAMAN, Consulting Engineer.

I HAVE PUZZLED OVER SAME QUESTIONS

I HAVE PUZZLED over the same questions as seem to perplex the mechanical engineer who submitted the Question of the Month in the March issue. The following discussion represents my own theories and deductions.

Question No. 1—The answer is very definitely yes. The quantity of air leaving *A* is a function of the area of *A* and the velocity of the air flowing through *A*. Therefore, assuming that the velocity of the air flowing through *A* can either be fixed or determined, there is only one area that will supply 200 cfm through *A* for a given leaving velocity.

Question No. 2—If the opening *A* is merely a hole in the side of the duct (as is shown) the air will not leave opening *A* in a direction perpendicular to that of the air flow within the duct. The air will leave *A* with a direction and magnitude equal to the vectorial sum of the velocity pressure and static pressure of the air in the duct opposite the opening at *A*. Upon leaving *A*, the static pressure component of the resultant total pressure is instantly converted into velocity pressure. This total resultant pressure is of course diminished by the frictional loss through the orifice; if a grille is used, particularly one with close bar spacing, this frictional loss must be considered.

In most cases it is desirable that the air leave the opening at right angles to the duct, rather than in the resultant direction as described above. This necessitates the use of

turning vanes or deflectors which add further to the frictional loss occasioned by the grille or orifice. This frictional loss will be a direct function of the velocity component of the total pressure in the duct.

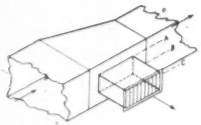
The question is whether or not all of the velocity pressure component is lost to friction when the air is turned 90 deg. If the air in the duct is motionless, the total pressure in the duct will be the static pressure, which is all converted to velocity pressure when the air leaves the duct (neglecting orifice friction) as when air is discharged from a plenum. Now consider an opposite hypothetical situation in which there is zero static pressure in the duct, the total pressure being entirely velocity pressure. This is strictly a theoretical condition, but should it exist there would be no air at all leaving the duct, since the velocity component acts only in a forward direction. From this (again neglecting orifice friction) we may deduce that the magnitude of the total pressure of air leaving a duct at an angle of 90 deg with the direction of air flow in the duct will be equal to the static pressure component of the total pressure within the duct or, more simply, all of the velocity pressure will be lost to friction. The above assumptions are not, of course, applicable when turning vanes or scoops are extended into the duct or for the terminal outlet of a run of duct.

Question No. 3—As described above, none of the velocity pressure would be converted into pressure acting perpendicular to the direction of air flow. The normal pressure would be the static pressure component of the total pressure inside the duct.

Question No. 4—See the preceding answer.

Question No. 5—Yes.

Question No. 6—For a simple hole in the duct as shown in the sketch, the frictional loss is rather small, and most of the normal pressure is converted into velocity pressure as the air leaves the duct. A grille with a number of bars or frets will be equivalent to the air flowing through a number of openings each with its own frictional loss. Since the orifice friction is related to the ratio of the perimeter of the opening to the area of the opening, it is obvious that more complex grille structures offer more frictional resistance to the flow of air. (See Bulletin No. 342, University of Illinois Experiment Station, *Pressure Losses in Registers and Stackheads In Forced Warm Air Heating.*)



THE EFFECT of a neck take-off between the grille and the duct, as sketched here, is analyzed

Question No. 7—Yes, provided the figures given in the tables include both the frictional loss through the grille and the velocity pressure.

Too much stress is placed in grille selection tables (in my opinion) on the length of throw, noise level, etc. These items are important to know, but none of them are worth very much if you don't get the required cfm from the grille. Therefore, total available pressure is the logical starting point in outlet selection.

When analyzing the flow of air from a duct system there are several other items worthy of note.

A very important point is the difference in performance of a grille in the side of the duct (one that supplies only a portion of the air from the duct, letting the remainder continue past the outlet) and a terminal outlet on a run of duct. In the latter case, all of the velocity pressure is retained by the air, and, in addition, that part of the static pressure not lost to friction is also retained and is converted into velocity pressure as the air leaves the grille.

In order to better understand the performance of side wall outlets we should analyze the effect of a neck take-off located between the grille and duct (see sketch above).

The case discussed in the answer to *Question No. 2* assumed that there was no neck section between the duct and grille. In most applications such a neck does exist and its effect must be considered. The total pressure at A is the total pressure inside the duct. Assuming that straightening vanes or some other device is installed between A and B to change the direction of the air 90 deg, the total pressure at B will be equal in magnitude to the static pressure component of the total pressure at A. This total pressure at B will also have a velocity and a static component, the velocity component now acting in a direction perpendicular to the direction of air flow in the main duct. The total pressure at C, just outside the grille, will be equal to the total pressure at B minus the frictional loss through the grille; the total pressure at C is all velocity pressure.

Under certain conditions the total pressure at B can be reduced to a magnitude less than that of the static pressure in the duct at A; however, it can never be increased to a value greater than the static pressure component of the total pressure in the duct at A. Assume that the actual free opening area of the grille is represented by A_c and the actual area of the duct opening admitting air to the neck section is represented by A_a.

As long as A_a is greater than A_c, the total pressure at B will be equal to the static pressure in the main duct at A. If A_a is decreased, no change in the total pressure at B is noted unless A_a is decreased to less than A_c. When this occurs, the section of duct (if it is of appreciable length) between A and the grille acts as a partial expansion chamber for the air leaving A. As A_a is reduced further beyond the value of A_c, a further reduction is obtained in the total pressure at B and consequently in the velocity of the air leaving the grille. Bear in mind, however, that increasing A_a will increase the velocity of the air leaving the grille only to the point where A_a reaches A_c as a limit. Further increase of A_a will not change the total pressure at B nor the velocity of the air leaving the grille.

Application of the above principles gives us a logical method of selecting grilles and relating this selection to the design of the duct system.

So far little has been mentioned regarding actual values of the frictional loss through the grille. It has been noted that some grille manufacturers apparently combine the grille frictional loss with the geometric free area and come up with a factor similar to an orifice coefficient. This method, while not theoretically precise, is accurate enough for practical purposes and lends itself to the calculation of outlet sizes.

I should like to recommend the following procedure for outlet selection:

a) From the manufacturer's rat-

ing and/or accepted standards determine the leaving grille velocity which will be acceptable from the standpoint of throw, noise, air motion, etc.

b) Determine the pressure equivalent for this velocity for standard air. This pressure must be available as the static pressure component of the total pressure in the main duct at a point adjacent to the outlet.

c) If the static pressure available in the main duct is greater than the quantity determined in Step (b) some device must be provided in the grille neck to reduce the total pressure behind the grille to the desired value.

d) If main duct available static pressure is less than required in Step (b) — as might exist near the end of a run of duct — either the duct system must be redesigned to make this static pressure available or the grille must be selected for operation at a lower velocity.

e) When the final design velocity is determined by Steps (a) through (d) the required grille area may be determined for any given quantity of air, provided the orifice coefficients for the grilles are known.

f) Terminal outlets (the last opening on a run of duct) represent a special case where the velocity head in the main duct is recovered by the outlet since the total pressure in the duct becomes the total pressure available behind the outlet.—L.W. THOMPSON, JR., Chief Engineer, Climatic Engineering Co.

WANTS HELP ON STEAM TRACING

IF YOU DON'T have the answer to one of your problems, chances are someone else does — or can be helpful on part of it. That's the purpose of this "idea exchange" in each issue, where questions on heating, piping and air conditioning are asked and answered.

You are invited to contribute a question for publication, or an answer to a published question. . . . . Please address your reply to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Here is a question asked by a project engineer on process piping. Can you help him out?

"I would appreciate it if you could supply us with information on the steam tracing of process piping lines or for other services. Data on sizing the piping, installation techniques, how it should be insulated, etc., is what we are after."

ELECTROMAGNETIC PUMP HAS NO MOVING PARTS

A DIRECT CURRENT electromagnetic pump which has no moving parts and which is capable of pumping large quantities of liquid metals at a rapid rate of flow was developed by Arthur H. Barnes, associate director of the Argonne National Laboratory's reactor engineering division, and Fred A. Smith and G. Kirby Whitham. It is being used to pump a liquid metal coolant through the laboratory's experimental breeder reactor at the Atomic Energy Commission's national reactor testing station in Idaho. Argonne scientists, using this reactor, produced the first known electricity from atomic energy, on December 20, 1951.

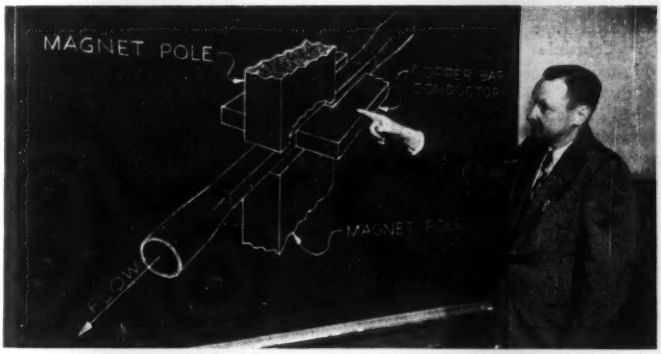
Since the pioneer work of Northrup in 1907, many investigators have developed a wide variety of apparatus for pumping liquid metals by electromagnetic means. In 1928, an alternating current electromagnetic pump was patented by Albert Einstein and Leo Szilard. The present interest in liquid metals as reactor coolants has served to spur the development of pumping equipment capable of handling such materials at high temperatures and in the presence of large quantities of intensely radioactive materials.

The pump developed at Argonne consists essentially of a straight piece of tubing, two copper bars and an electromagnet. The tubing is thin walled stainless steel or nickel-chromium alloy which is pressed into a rectangular cross section. Heavy copper bars are silver soldered to opposite sides of this tubing. The assembly is then placed between the poles of an electromagnet and inlet and outlet pipes are attached to the tubing. An electrical current, entering the wall, passes through the liquid, and develops in it a longitudinal thrust.

The electrical current used to operate this pump is 20,000 amp at 1 volt. Because of this low voltage drop, the insulation problem is practically non-existent. This is a very desirable feature inasmuch as high temperature and radiation would tend to affect pumps which require insulation. The pump can be run continuously with liquid metals at a temperature of 750 F.

The Argonne pump is a completely sealed, all metal system. Since it does not contain moving parts, there are no bearings to wear or require attention. This is particularly advantageous where the material being pumped has become radioactive. Because it has no moving parts and operates on direct current, it is completely free of vibration.

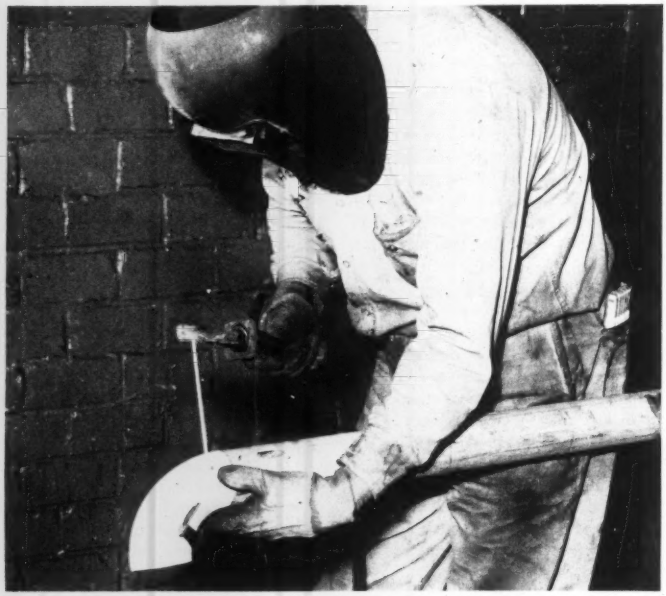
Pumps of greater capacity can be constructed by scaling up the equipment and increasing the current.



DR. ARTHUR H. BARNES points to a schematic drawing of the electromagnetic pump he developed.

Stainless 5S Pipe Is Added

American Standard B36.19 Revised To Include Dimensions for Light Weight 5S



WELDING SCHEDULE 5S pipe requires special attention to procedures called for in applicable codes, specifications. (Photo courtesy Tennessee Eastman Co.)

THE RECENTLY REVISED edition of American Standard B36.19 on Stainless Steel Pipe includes dimensions for Schedule 5S pipe. J. D. Mattimore† explained the significance of the revisions in an article published in Standardization, the American Standards Association news magazine, as follows:

Issuance of the revised edition is welcome news [said Mr. Mattimore] to those users who, for reasons of procurement of critical stainless steel, as well as for economy, have had need for such a light weight pipe standard. It also is particularly worthy of note because it represents the first tangible accomplishment of the ASA Chemical Industry Correlating Committee, which was organized in May 1950. In addition, while it would not be entirely correct to say that the need for the Schedule 5S standard caused the creation of CICC, it is certainly true that that need, and an informal meeting held in September 1948 to discuss it, began the process.

To fully understand the importance of including Schedule 5S in B36.19 it is necessary to know that the original edition of the standard in 1949 covered three schedules of pipe thickness for sizes ⅛ in. through 12 in., designated respectively Schedule 10S, 40S and 80S in order of increasing thickness. Schedules 40S and 80S, respectively, have the same thickness as standard wall and extra strong wall wrought steel pipe covered by American Standard B36.10-1930 (now B36.10-1950). Schedule 10S pipe, however, represented the first new schedule of thickness to be standardized in over 15 years; it is approximately one-half the weight of Schedule 40S or standard wall pipe and consequently is thought of as light weight pipe.

Schedule 5S, listed in the revised edition of American Standard B36.19, is approximately one-third lighter in weight than Schedule 10S and is therefore roughly a third the weight of Schedule 40S. This saving in weight of critical materials in a time of national emergency is, of course, extremely important. In addition, for those whose service conditions permit the use of Schedule 5S pipe, it offers a substantial saving in cost over that of Schedule 10S.

Major Credit To Piping Contractors

The major credit for recognizing the need for a standard covering stainless steel pipe must go to the Heating, Piping and Air Conditioning Contractors National Association. Hardly had hostilities ceased in 1945 when the lack of such a standard caused the members of that organization considerable embarrassment and no small expense in trying to assemble stainless steel piping systems from components for which no standards existed.

Under the sponsorship of the HPACCNA standards and research committees, a meeting was held in Pittsburgh attended by representatives of the technical committee on pipe and tubing of the American Iron and Steel Institute, manufacturers of pipe and of welding fittings, as well as by piping contractors themselves. The result was tentative agreement on dimensions for Schedules 10S, 40S and 80S, which were forwarded to the ASA with the request that they be considered as the basis of a new American Standard.

†Mr. Mattimore, chief engineer of Tube Turns, Inc., represents The American Society of Mechanical Engineers on the Chemical Industry Correlating Committee. He is chairman of the CICC subcommittee on stainless steel and corrosion resisting pipe and fittings. Sectional committee B36, which is responsible for preparation of standards on wrought iron and wrought steel pipe and tubing under ASA procedures, is sponsored by the American Society of Mechanical Engineers and the American Society for Testing Materials.

As a consequence, ASA sectional committee B36 created its subcommittee No. 2 on stainless steel pipe under the chairmanship of J. J. B. Rutherford, of the Babcock & Wilcox Co.'s tubular products division. Under the jurisdiction of this subcommittee the actual work of creating American Standard B36.19 has been carried out.

Before the work on the initial publication of B36.19 in August 1949 had reached fruition, the needs of the chemical industry for still lighter weight stainless steel pipe became pressing. An informal conference of chemical industry representatives and producers of stainless steel welding fittings was held in New York in September 1948 to determine how that need could best be filled. The decision reached was that a schedule of pipe, tentatively designated Schedule 5S, having a wall thickness about one-third lighter than Schedule 10S pipe, would be the best solution. The degree to which the wall thickness could be lightened was determined by consideration of practical difficulties of field welding the smaller sizes (which would have the thinnest walls), and resistance to collapse under vacuum of the larger sizes.

A very happy but unforeseen outcome of the September 1948 meeting was recognition by the chemical industry representatives present of the desirability of having their requirements adequately considered in the formulation of American Standards governing equipment extensively used by their industry. This resulted in the creation of the first ASA Chemical Industry Correlating Committee early in 1950.

One of the first projects considered by the CICC was development of standardized dimensions for stainless steel pipe lighter than Schedule 10S. In December of that year the CICC called a meeting of all interested consumers and producers to determine whether the schedule of thicknesses proposed for Schedule 5S in 1948 would still meet the majority of industry's requirements. The great preponderance of opinion was in favor of standardizing on those thicknesses. The CICC therefore sent a formal recommendation to ASA sectional committee B36 that they be added to B36.19. The present revision of B36.19 is the result of that recommendation.

DATA SHEET

TABLE 1 — DIMENSIONS OF welded and seamless stainless steel pipe

Nominal pipe size	Outside diameter	Nominal wall thickness Schedule 5S**	Schedule 10S**	Schedule 40S	Schedule 80S
1/8	0.405	....	0.049	0.068	0.095
1/4	0.540	....	0.065	0.088	0.119
3/8	0.675	....	0.065	0.091	0.126
1/2	0.840	0.065	0.085	0.109	0.147
3/4	1.050	0.065	0.083	0.113	0.154
1	1.315	0.065	0.109	0.133	0.179
1 1/4	1.660	0.065	0.109	0.140	0.191
1 1/2	1.900	0.065	0.109	0.145	0.200
2	2.375	0.065	0.109	0.154	0.218
2 1/2	2.875	0.083	0.120	0.203	0.276
3	3.500	0.083	0.120	0.216	0.300
3 1/2	4.000	0.083	0.120	0.226	0.318
4	4.500	0.083	0.120	0.237	0.337
5	5.563	0.109	0.134	0.258	0.375
6	6.625	0.109	0.134	0.280	0.432
8	8.625	0.109	0.148	0.322	0.500
10	10.750	0.134	0.165	0.365	0.500*
12	12.750	0.165	0.180	0.375*	0.500*

All dimensions are given in inches.
The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions.
For tolerances, see Par. 4, Introductory Notes in the Standard.
*These do not conform to ASA B36.10.
**Schedule 5S and 10S wall thicknesses do not permit threading in accordance with ASA B2.1.
Extracted from American Standard Stainless Steel Pipe (ASA B36.19-1952), with the permission of the publisher, The American Society of Mechanical Engineers, 29 W. 39th Street, New York 18, N. Y.

TABLE 2 — NOMINAL WEIGHTS of steel pipe[1,2]

Nominal pipe size	Weight of steel pipe, plain ends Schedule 5S	Schedule 10S	Schedule 40S	Schedule 80S
1/8	....	0.19	0.24	0.31
1/4	....	0.33	0.42	0.54
3/8	....	0.42	0.57	0.74
1/2	0.54	0.67	0.85	1.09
3/4	0.69	0.86	1.13	1.47
1	0.87	1.40	1.68	2.17
1 1/4	1.11	1.81	2.27	3.00
1 1/2	1.28	2.09	2.72	3.63
2	1.61	2.64	3.65	5.02
2 1/2	2.48	3.53	5.79	7.66
3	3.03	4.33	7.58	10.25
3 1/2	3.48	4.97	9.11	12.51
4	3.92	5.61	10.79	14.98
5	6.36	7.77	14.52	20.78
6	7.60	9.29	18.97	28.57
8	9.93	13.40	28.55	43.39
10	15.23	18.70	40.48	54.74
12	22.22	24.20	49.56	65.42

All dimensions are given in inches.
[1]Weights are given in pounds per linear foot and are for carbon steel pipe with plain ends.
[2]The different grades of stainless steel permit considerable variations in weight. The ferritic stainless steels may be about 5 percent less, and the austenitic stainless steels about 2 percent greater than the values shown in this table which are based on weights for carbon steel.
Extracted from American Standard Stainless Steel Pipe (ASA B36.19-1952), with the permission of the publisher, The American Society of Mechanical Engineers, 29 W. 39th Street, New York 18, N. Y.

SAM LEWIS' PAGE

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems

MY GREAT GRANDFATHER, Jehu Lewis, was a member of the religious Society of Friends, often called Quakers. He was frequently sought after for advice — perhaps because, like Solomon, the dear old man prayed for wisdom.

Sometimes I wonder whether I have inherited a little of Jehu's standing in the neighborhood?

Comes the following question from a reader of my "Page": "We heat a garage with a steam boiler rated at 2600 equivalent square feet. The connected load is 1417 equivalent square feet. There are two main pipes, one to deliver steam to the radiation and one to return the condensate from the radiation.

"The radiators all are above the return mains and all are fitted with valves through which steam may force out the air. These air valves close whenever steam reaches them. The steam mains and the return mains all pitch downward toward the boiler.

"We have plenty of heat. We have no noise from pipes or radiators. An automatic controller speeds up the fire when the mercury in the thermostat on the wall falls below 55 deg and slows it down as soon as the room temperature rises to 70 deg. When the intensity of the fire increases, the water level shown in the gage glass may be lowered about 1½ in., but this reducing of the water level is not sufficient to trip the low water cut-off switch.

"During the cycle of increasing and decreasing the room temperature, the steam gage fails to indicate any pressure in the boiler.

"Please let me know whether this absence of steam pressure is normal, and please suggest what should be done?"

I have not seen this plant, but the description suggests that it is a pretty good one.

Here are several probable excuses for abnormality, as follows:

a) The coordination between the oil burner and the boiler demand may be so excellent that no noticeable pressure within the boiler is required. This pressure may be in fractions of a pound — not sufficient in intensity to indicate any noticeable reaction on the steam gage.

b) The steam gage may be defective, and might not indicate any pressure, regardless of a pressure approaching that which would open the safety valve. The gage probably depends on a curved tube that is coupled by a rack and pinion to the pointer. If the pressure inside the tube increases, the tube tends to straighten, thus moving the pointer.

If I were to visit the boiler room, I would substitute a new pressure gage (preferably one that would indicate pressures both above and below atmospheric) and thus would assure myself that no obscure danger lurks.

It seems very likely that I would congratulate this reader on the possession of what seems to be an excellent plant, which heats the building at a pressure so close to that of the atmosphere that no indication is necessary.

Here are my comments on a different heating question, inspired by a request for advice from another reader and based on my experience:

There are many heating plants in which hot water is circulated continuously through the radiators or convectors by an electric pump, with a water mixing valve responding to instructions from an outdoor thermostat, to vary the proportion of recirculated water to hot water coming from the converter.

In one such system, the water in the converter (elegantly called a "calorifier" in England) is heated by steam from a remote boiler. There is an aquastat in the hot water leaving the converter, which opens or closes a valve in the steam supply pipe to the converter. In operation during normal winter weather, the outdoor thermostat sends word to the mixing valve all right, but the inertia or flywheel effect of the stored heat is so great that the average temperature of the building becomes too high.

The mixing valve might be too large, especially as to its intake for heated water. My conclusion is that for a forced hot water heating system that uses a steam heated calorifier, a satisfactory scheme might be to let the water all go through the converter-calorifier — controlling the valve on the steam supply to this device by the outdoor thermostat. The mixing valve on the hot water main of course would be removed and saved for some more pertinent job.

On another project, the hot water is warmed by being pumped through a fuel burning boiler, and the mixing valve permits bypassing around the boiler the part of the water that is recirculated. The boiler in this case has no other duty than to heat the building. The rate of fuel combustion can be controlled effectively by the outdoor thermostat. The temperature of the water leaving the boiler easily can be varied through a wide range, but in this case the mixing valve has an excellent opportunity to prove its ability to save fuel.

We have another example, where the direct fired boiler also must heat domestic water, with the boiler water constant at around the temperature of low pressure steam. The mixing valve would control the temperature of the water circulating through the radiators. Our experience suggests that the passage for hot water to the mixing valve should be less in capacity than the passage for bypassed water.

The rate of fuel combustion could respond to the domestic hot water temperature, or to an aquastat in the converter, but the outdoor thermostat for controlling the mixing valve, and this valve, have a definite place.

When the space to be heated comprises a single room, permitting a local indoor thermostat, it appears acceptable to substitute an indoor thermostat for the outdoor thermostat.

The more I learn about "zoning" for a large building, in an attempt to save a few thermostats, the more I lean toward making every room a separate zone.

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL *SECTION*

Experimental Data on Drying Atmospheric Air for a Supersonic Wind Tunnel

By W. E. Emley, Jr*., Cleveland, Ohio

SUMMARY — Dry air is required for the satisfactory operation of supersonic wind tunnels used for most aeronautical research investigations. At the Lewis Flight Propulsion Laboratory of the *NACA*, Cleveland, Ohio, it has become necessary to provide air dried to −40 F dew point at a rate in excess of 1,500,000 cfm for prolonged periods of time. Lack of published information directly applicable to this and similar air drying problems necessitated a desiccant evaluation program to evolve comparative as well as abstract data concerning the performance of commercially available adsorbent materials. A pilot dryer was constructed and operated over a range of face velocities, bed depths, and inlet air conditions simulating feasible design values for a large scale adsorptive air dryer. Three adsorbent materials were investigated, namely, granular silica gel, pelletized silica gel, and activated bauxite. Results of this program and comparative performance under stipulated conditions are presented.

AT ITS LEWIS Flight Propulsion Laboratory, the *NACA* conducts research on large supersonic aircraft propulsion devices such as ramjet and rocket engines. An air stream with a uniform velocity which may be several times the local speed of sound, or above Mach number 1, is presented to the engine configuration under investigation in order to create an environment similar to that which the configuration would encounter if it were actually flying at high speed and at high altitude. Since the heat and combustion products from the engine exhaust are injected into the supersonic air stream at very high rates, economy dictates an open rather than a closed circuit type wind tunnel for this application. This means that the entire mass flow of air passing through the tunnel must be drawn from the ambient atmosphere and passed through a dryer before being introduced into the tunnel. The volume flow rate of air through one existing propulsion wind tunnel exceeds 1,500,000 cfm and for future installations which will accommodate even larger engines at higher simulated speeds, the volume flow rate of air may be even greater.

*Mechanical Engineer, *National Advisory Committee for Aeronautics*, Lewis Flight Propulsion Laboratory.

Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Spring Lake, N. J., June 1952.

Dry Air Required

In accelerating air to supersonic velocities, it is cooled to very low free-stream temperatures by adiabatic expansion, and must therefore be very dry if condensation of moisture in the tunnel air stream is to be prevented. Extensive experience has shown that the condensation of airborne water vapor actually occurs in a supersonic wind tunnel unless the air introduced has been thoroughly dried or unless its temperature has been raised to a high enough value so that subsequent adiabatic expansion will not lower its temperature below the dew point. This condensation occurs at that point in the Laval nozzle of the tunnel where the

air temperature passes downward through the dew point of the air and results in what are known as condensation shock waves, which, to the aerodynamicist, are abrupt changes in entropy within the air stream. These shock waves cause disturbances

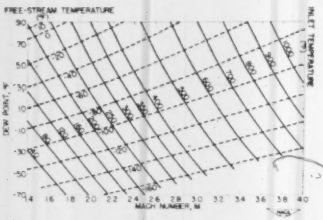


Fig. 1 — Criteria for condensation-free flow in supersonic wind tunnels (from *NACA Technical Note No. 2518*)

and irregularities of the air flow in the test section of a wind tunnel. Therefore, if the severity of the condensation shock wave is sufficiently great, the usefulness of the supersonic wind tunnel can be impaired and accurate quantitative results be unobtainable. If the moisture content of the air is of even greater magnitude, condensation droplets will form in the air stream and may obscure completely the model being investigated.

To provide a sensitive, accurate, and useful wind tunnel for research investigations on supersonic propulsion devices and their respective flight installations, it is necessary to provide air of sufficient dryness so that the severity of the moisture condensation shock wave, if it occurs, will not introduce a significant error in the qualitative or quantitative results to be obtained.

Fig. 1[1] shows the criterion for condensation-free flow in a supersonic wind tunnel. The dashed lines indicate the free stream temperature that will theoretically be encountered when the air with an inlet temperature represented by the solid lines is adiabatically accelerated to the Mach number selected on the abscissa. The ordinate represents the inlet air dew point theoretically necessary to prevent the occurrence of significant condensation shock waves. This theory takes into account the frequency of condensation nuclei, time required for condensation to occur, velocity of air stream, and other considerations. Experimental data have borne out the accuracy of this theory through a range of dew points of as low as −20 F and through a range

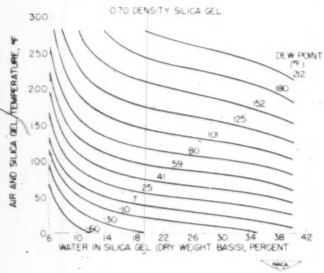


Fig. 2 — Water vapor equilibrium isopiestics for silica gel of 0.70 density

of Mach numbers as high as 2.0, and experience in the operation of supersonic tunnels has indicated that significant moisture condensation shock waves will not occur when the entering dew point is less than −40 F, even with Mach numbers as high as four. Complete elimination of moisture condensation within the tunnel air stream at high Mach numbers is impracticable because of the very low dew points and very high inlet air temperatures required. Even though the shock waves do occur using air with a dew point of less than approximately −40 F, their intensity is so weak that they are difficult to observe or measure and their effect on the tunnel performance is negligible for most purposes. It was therefore determined that throughout the operating range of a proposed wind tunnel, air at a dew point of −40 F or lower would be sufficiently dry.

The selection of the design points for the desiccant evaluation studies was based on several studies of average Cleveland summer weather and the assumption that a dew point of the effluent air should be −40 F or lower. Inlet air conditions were specified as follows: 85 F dry bulb, 73 F wet bulb, 68 F dew point, and 57 percent relative humidity. Assumed volume flow rates, duration of operating cycle, allowable pressure drop through the air dryer, and other practical considerations established

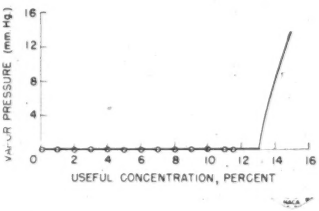


Fig. 3 — Isothermal water vapor adsorption capacity of 8-14 activated alumina showing break point at 13 percent useful concentration

the range of face velocities and bed depths considered in the pilot air dryer.

It was not necessary to provide a continuous supply of dry air because continuous operation of a research wind tunnel for long periods is not to be expected. Periodic shut-downs of varying durations to repair or modify the model installation or to change models are contemplated, and sufficient time will be available between tunnel runs or operating periods to reactivate an adsorptive air dryer.

Air Drying Methods Considered[2]

Studies were made of the application of all feasible methods for drying atmospheric air at the rate required. Refrigeration, absorption, compression and re-expansion, and adsorption, together with combinations there-of, were considered in turn, but primarily because of the high volume flow rate and the cyclic operation, direct adsorptive drying appeared most feasible. Although this process might limit tunnel operating time during adverse summer weather conditions, it inherently provides very long operating times during spring, fall, and winter months. Considering the original cost, complexity

[1]Exponent numerals refer to References.

of installation and operational aspects, as well as other features, adsorptive drying seemed a prudent choice of methods.

Dynamic Adiabatic Adsorption

Much has been written on the theory and practice of vapor adsorption by well-qualified persons. No attempt will be made here to review the literature on the subject. However, to analyze a particular problem, such as that referred to, it may be well to review several basic concepts relating to vapor adsorption.

Every surface is adsorptive of every gas and vapor. The capacity of a surface to adsorb a given vapor or gas is dependent on several factors, such as the partial pressure of the vapor in the gas and in the surface structure of the material, the specific surface area of the material, the temperature of the adsorption system and the other physical characteristics of the material which provide empirical equilibrium pressure data called isopiestics.

Because of extreme surface area per unit volume, fineness of pores, and insolubility in condensed vapors, certain substances such as activated charcoal, bone char, silica gel, and activated bauxite display tremendous capacities for vapor adsorption and find commercial application as adsorbents.

Isopiestic data have been developed experimentally for some desiccants and a typical plot of these data is shown in Fig. 2 for silica gel. These data are very useful in the design of static drying equipment, such as packaging applications, since the quantity of desiccant required can be determined with reasonable accuracy if the operating temperature, container volume, leakage rate, and required dew point are known. It should be noted that the curves on Fig. 2 are asymptotic to an ordinate value of 6 percent, which represents the residual moisture after reactivation of the gel. The useful concentration at various equilibrium conditions is therefore 6 percent less than the ordinate values shown.

The application of isopiestic or equilibrium capacity data to the problem of dynamic adsorption introduces several interrelated variables. One of these is contact time, which includes factors for mean particle size, average air stream velocity normal to the adsorbent bed surface, bed depth parallel to air flow, and partial pressure or molecular density of the vapor to be adsorbed.

Another variable which must be considered is the effect of the heat released by condensation of adsorbed vapor on the temperature at which the adsorption occurs. The moisture content and flow rate of the influent air or gas determines the rate at which heat is released. This rate in turn, combined with associated heat transfer to the adsorbent and to the air or gas stream, determines the temperature of any particular particle of adsorbent and hence its capacity and efficiency at any particular instant. Practically, the influent air removes this heat gradually and as the drying cycle progresses the adsorbent upstream of the zone of maximum activity is gradually cooled to approach the temperature of the inlet air and thereby its capacity is increased to approach that indicated on the isopiestic plots. The adsorbent downstream from the zone of maximum activity is being heated simultaneously and its capacity and efficiency are correspondingly reduced.

It therefore follows that in a dynamic adsorption process which has no means provided for removing the heat of adsorption other than the flowing gas stream, the adsorbent on the upstream side of the bed will continue to adsorb moisture from the inlet gas until its vapor pressure is in equilibrium with that of the incoming gas. This value may be determined from an isopiestics plot such as Fig. 2. As soon as the dew point of the effluent air rises above −40 F, in the present example, it is said a break point is reached. This will occur when the layer of adsorbent on the downstream side of the bed has an isopiestic value of −40 F, as determined from the same plot. At the break point then, the inlet of the bed has a relatively high moisture content while the outlet side has a very low moisture content. The integration of these values throughout the bed at the time of the break point occurrence would result in an overall useful concentration applicable to the specific problem studied, and as may be expected, this value is found to be much greater than the isopiestic value corresponding to the effluent condition and somewhat less than the isopiestic value for the inlet condition.

Efforts have been made to determine on an empirical basis the overall useful concentration which can be expected for a desiccant drying air in a dynamic system, assuming various lengths of contact time, inlet temperatures, moisture concentrations, and outlet dew points. A survey of the literature will indicate that these efforts have not been successful but that some data are available which were evolved in answer to specific problems.

The nearest approach to general dynamic adsorption data that has been published is illustrated by Fig. 3 which shows a plot of the useful concentration of activated alumina as a function of the dew point of effluent air. These data, however, represent an isothermal dynamic adsorption and eliminate the thermal effects on desiccant performance actually encountered in practical adiabatic adsorption towers that are not cooled during the adsorption process.

Description of Pilot Air Dryer

The lack of specific information concerning relative performance of adsorbents in an adiabatic dynamic air dryer such as the one already mentioned, prompted the decision to obtain the needed data by means of a pilot plant operation. Since the selection of the type and quantity of adsorbent would be a very significant factor in the cost and ultimate usefulness of the supersonic propulsion wind tunnel, it was felt that an installation of the cost and magnitude under consideration by the *NACA* warranted the expense of obtaining accurate design information.

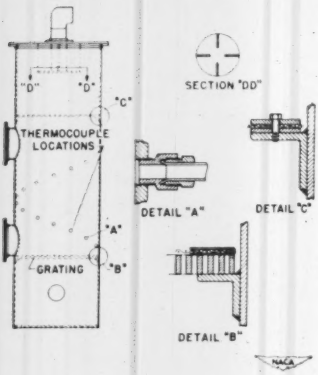


Fig. 4 — Structural details of pilot dryer

Considerations of capacity (physical properties), efficiency, cost and availability of commercial desiccants resulted in the decision to obtain comparative as well as abstract information on three desiccants; silica gel, pelletized silica gel, and activated bauxite. Mesh sizes were comparable for each material.

To simulate actual adiabatic conditions such as might occur in a large dryer, the pilot dryer, illustrated in Fig. 4, was made of a 36-in. diameter pipe and insulated with one inch magnesia block. The adsorbent was retained on a steel grating covered with ¼-in. mesh hardware cloth and 16-mesh copper screening. Hand holes permitted filling the bed to a depth of as much as four feet and inspection of the support structure within the tank as well as the removal of the adsorbent. Plenum chamber and diffuser baffles were installed above the bed so that incoming air, flowing downward, would present a uniform velocity approaching the bed surface. Similarly, a space below the bed support was provided so that air flow might be distributed evenly throughout the entire bed area.

The pilot dryer was designed to use reactivation equipment already in operation with an existing air dryer. From the diagram (Fig. 5), it can be seen that reactivation was achieved by blowing electrically heated air through the dryer in the reverse direction to normal air flow and by condensing the reevaporated moisture on cooling coils just upstream of the blower. Cooling was effected by circulating air through the system in the normal flow direction, sensible heat being removed by the same coils. A by-pass line around the dryer permitted the establishing of desired conditions before the dryer was put on stream.

By controlling the moisture injection rate, the quantity of ambient air mixed with the recirculated dried air, and the flow rate through the beds, it was possible to maintain inlet air conditions nearly constant through a cycle of drying. Water

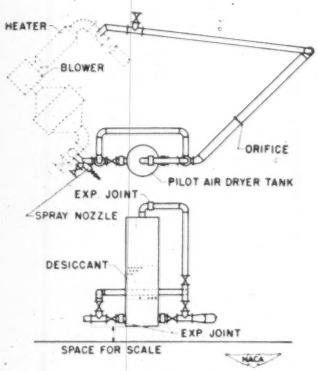


Fig. 5 — Piping system for pilot dryer

was introduced by injection through a spray nozzle at the point indicated on Fig. 5 and flow rate and adsorber pressures were established and maintained by manipulation of the valves at the dryer.

A range of dry-bulb temperatures, specific humidities, and flow rates were used in tests to include the selected design point. Neither time nor flexibility of the pilot plant installation permitted investigations over a wide range of conditions but it is believed that sufficient data were obtained to establish the independent effect of some of the independent variables. The range of variables covered by the various data points are as follows:

Dry-bulb temperature of entering air, 73 F to 95 F

Dew point temperature of entering air, 59 F to 77 F

Average velocity of air normal to bed surface, 10 to 100 fpm

Bed thicknesses, 12 to 36 in.

The pilot dryer was adequately instrumented to obtain data on pressure, temperature, and mass flow conditions for each run. Pressure taps connected to water manometers indicated static pressure above and below the bed and across a standard *ASME* sharp edge orifice installation which was calibrated so that the mass flow through the dryer could be computed accurately.

Temperatures were measured by iron-constantan thermocouples and included the temperature of: the air entering and leaving the bed, the air at the orifice, and the air entering and leaving the cooler. Additional thermocouples were inserted radially in the dryer a distance of 12 in. from the shell and at 3-in. elevation intervals as measured from the bottom of the bed.

The humidity or moisture content of the inlet air was determined from both wet- and dry-bulb thermometers in the upstream air and by a humidity recorder. A further check on the inlet humidity was found by assuming saturation of the air after it passed through the cooler and before

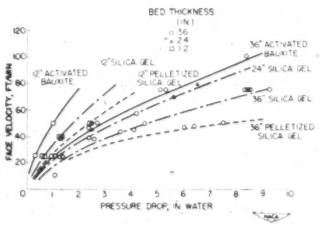


Fig. 6 — Summary of pressure drop data obtained from *NACA* pilot dryer

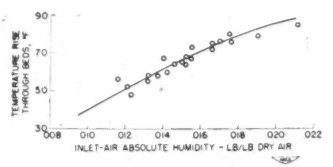


Fig. 7 — Summary of temperature rise data obtained for *NACA* pilot dryer

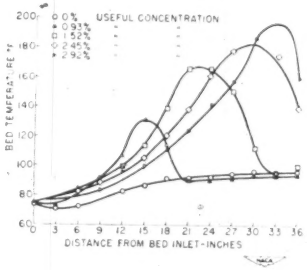


Fig. 8 — Typical bed temperature variation — *NACA* pilot dryer

it was heated by the circulation blower. Dew point of the effluent air was obtained by simultaneous readings of several instruments including a cloud chamber type of dew point meter, two types of dew point recorders, and occasionally a dew point cup. Correlation of readings between instruments was not always good, but sufficient consistency was observed to result in capacity and dew point depression data which are on a comparative basis for the adsorbents tested.

Air flow was approximated at the beginning of each run by using pressure drop data published by the desiccant manufacturers and actual values carefully computed later from the orifice measurements.

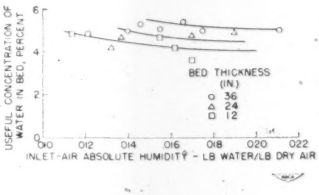


Fig. 9 — Plot of useful concentration *vs.* absolute humidity of influent air for silica gel — *NACA* pilot dryer

Table 1 — Summary of Data from Pilot Air Dryer

Material	Bed thickness In.	Face velocity Ft./min	Entering dry-bulb temperature F	Entering dew point F	Entering absolute humidity lb/lb	Leaving dew point at break point F	Useful concentration %	Maximum temperature rise F deg
Silica gel	12	24	77	58	0.0105	—45	4.9	58
		25	85	71	0.0164	—30	4.2	62
		39	82	62	0.0119	—44	4.9	52
		40	86	69	0.0153	—35	4.7	56
		40	94	72	0.0170	—32	3.7	59
	24	40	85	75	0.0188	—40	4.9	79
		40	77	66	0.0137	—48	4.7	58
		69	80	72	0.0170	—39	4.3	76
		72	74	65	0.0133	—40	4.2	68
	36	45	86	71	0.0164	—35	4.4	72
		43	84	75	0.0188	—36	5.0	80
		50	81	67	0.0142	—42	5.3	64
		50	96	75	0.0188	—38	4.5	54
		75	91	77	0.0202	—49	5.0	58[a]
		75	84	71	0.0164	—39	5.4	75
		75	80	69	0.0153	—39	5.1	73
		75	79	66	0.0137	—38	5.0	67
Pelletized silica gel	12	25	73	63	0.0124	—20	4.2	48
		50	78	65	0.0133	—23	3.9	58
	36	50	79	68	0.0148	—38	3.6	65
		50	78	65	0.0133	—27	2.8[b]	55
		50	74	67	0.0142	—45	3.7	60
Activated bauxite	36	10	75	63	0.0124	—45	3.1	44
		24	92	70	0.0158	—51	3.3	48
		24	80	61	0.0115	—45	3.5	56
		25	74	65	0.0133	—52	3.4	58
		39	86	76	0.0195	—51	3.2	116
		39	82	66	0.0137	—47	3.3	70
		39	81	65	0.0133	—55	3.3	71
		50	83	69	0.0153	—57	3.1	67
		75	82	69	0.0153	—55	3.4	68
		75	85	73	0.0176	—45	3.5	76
		100	84	69	0.0153	—52	2.9	64

[a]Low initial bed temperature.
[b]High initial bed temperature.

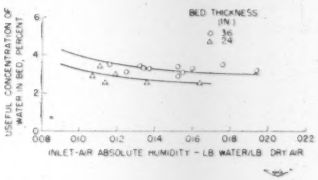


Fig. 10 — Plot of useful concentration *vs.* absolute humidity of influent air for activated bauxite — *NACA* pilot dryer

Moisture holding capacity was determined by computation from air flow data and checked very closely by actually observing the increase in weight of the entire dryer, which was mounted on platform scales and connected to the piping by flexible connections which were made airtight. The accuracy and sensitivity of the scales were checked before and after each run. The scales also were used as a check on the thoroughness of reactivation after a run was completed.

Information obtained from the pilot plant operation not only provided realistic bases for the design of a dynamic adsorber but also served as a check on previously published data concerning pressure drop through beds, anticipated temperature rise of effluent air, and temperature rise within the bed. Some of these data are included in Figs. 6, 7 and 8.

Results

Table 1 shows some of the significant information obtained from each run, including entering air conditions, useful concentration, or percent dry weight of moisture adsorbed, and effluent air dew point at the time the break point or sudden rise of effluent air dew point was observed. Selection of the break point was quite

Table 2 — Relative Performance of Commercial Desiccants Tested

Material	Effluent dew point at breakpoint (Average) F	Useful concentration Average Percent
4-8 mesh activated bauxite	—52	3.33
Pelletized silica gel	—37	3.85
3-8 mesh silica gel	—44	5.13

significant and usually required careful study of related conditions such as leveling off of effluent air temperature and close observation of dew point meter readings.

The summation of curves showing effluent air dew point plotted against useful concentration for each run resulted in plots for silica gel and activated bauxite shown in Figs. 9 and 10, respectively. It should be emphasized that the evaluation program was undertaken primarily to determine the relative performance of the three desiccants at or in the vicinity of the design conditions, which are based on Cleveland summer weather, and within the feasible limits of velocity and bed thickness. Variation of useful concentration with deviation from design conditions was of secondary interest and it developed that the pilot plant did not readily permit sufficient deviation from the design inlet air temperature and humidity conditions to establish accurately the quantitative changes in useful concentration values of each independent variable, though the expected trends were observed in most runs.

The most significant variable observed to affect the useful concentration was the absolute humidity or moisture content of the influent air, as this affected directly the temperature at which adsorption occurred and hence the capacity and efficiency of the material. Figs. 9 and 10 are therefore plotted with absolute humidity as the abscissa and useful concentration as the ordinate, without reference to inlet air temperature and contact time.

An overall summation of the data obtained follows. It should be noted that these results apply only to the conditions specified and extreme precaution should be used in interpreting these results and applying them to another drying problem.

With the information in Table 2 available, detailed studies were made of the physical aspects of dryers meeting the design requirements and using each of the three adsorbents. Final selection of adsorbent material and physical dimensions of a dryer for any specific application should be based on the relative cost of the respective installations after detailed price data have been compiled for the bed housing and reactivation equipment as well as for the adsorbent. It may be observed that activated bauxite has less capacity but higher drying efficiency than silica gel and that pelletized silica gel, under the conditions specified, has less capacity and less dew point depression than granular silica gel. These trends have been observed by other investigators[2]. They may possibly be explained by the theory that the mean capillary radius of the activated bauxite is smaller than that for silica gel and is the cause of a lower equilibrium vapor pressure for the bauxite in contact with water vapor-air mixture. Silica gel, however, has more surface area and probably more capillary volume per unit volume of particles and hence more moisture holding capacity than the bauxite. Pelletized material presents less exterior surface per unit volume to the gas stream than granular materials and therefore requires longer contact time to reach equilibrium with the air stream than a granular form of the same material.

Conclusions

Interpretation of the data obtained as a result of the desiccant evaluation program provided values for the comparative performance of silica gel, pelletized silica gel, and activated bauxite under the specified design conditions. These values were used to compute the overall cost of using each of the three desiccants and served as a sound design basis for determining the actual quantity of material that would be needed for a specific air dryer installation. Useful corollary data such as air pressure drop through the beds of desiccant and air temperature rise were also obtained, these data being necessary in the structural design of the dryer bed housing and reactivation equipment.

Acknowledgment

The cooperation of The Davison Chemical Corp. and Aluminum Company of America in permitting the use of charts in Figs. 2 and 3, respectively, is gratefully acknowledged.

References

1. Criterions for Condensation-Free Flow in Supersonic Tunnels (*National Advisory Committee for Aeronautics, Technical Note 2518*).

2. Design and use of Adsorptive Drying Units, by R. C. Amero and J. W. Moore (*Chemical Engineering Progress*, Vol. 43, July 1947).

3. *Silica Gel, Its Use as a Dehydrating Agent*, by F. C. Dehler (The Davison Chemical Corp., Baltimore, Md.).

4. Drying of Air for Use in Supersonic Wind Tunnels. (*Industrial Heating*, February 1951)

5. The Design and Performance of an Air-Drying System for a Supersonic Wind Tunnel, by R. T. Patterson (Navy Department, *Aero Report 811*, December 1951).

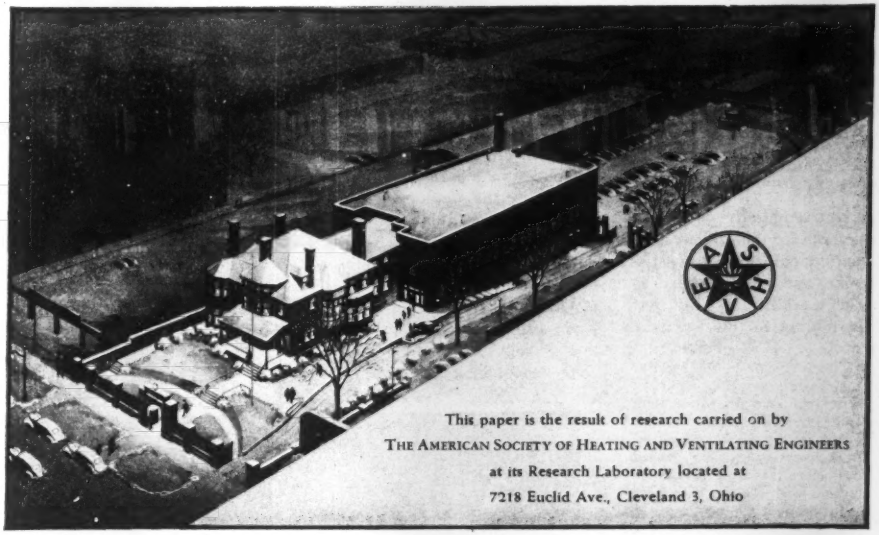
Personal Notes

Past president ALFRED J. OFFNER and Mrs. Offner sailed on the S. S. America, May 29, for a four months' European trip during which they will visit Ireland, England and Scotland, Norway, Sweden, Finland, and Denmark.

From Bergen, Norway, they will make a North Cape Cruise on a mail boat to the Land-of-the-Midnight Sun. A brief stay will be made in Holland, Belgium, Germany, and Switzerland, and after a visit to Paris and other parts of France, they will return to the United States on the new S. S. United States.

•

JOHN P. SOULE on military leave of absence from the American Radiator & Standard Sanitary Corp., Pittsburgh, Pa., is on an engineering assignment at the office of the Chief of Naval Operations, Washington, D. C., on temporary active duty.


This paper is the result of research carried on by
THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
at its Research Laboratory located at
7218 Euclid Ave., Cleveland 3, Ohio

A Smoke-Filament Technique for Experimental Research in Room Air Distribution

By H. B. Nottage*, J. G. Slaby**, and W. P. Gojsza**, Cleveland, Ohio

SUMMARY — A simple technique has been developed for using smoke filaments to establish flow patterns and velocity directions in experimental investigations of room air distribution. Smoke filaments are capable of yielding quantitative data in slow, wandering flow where other methods fail. Smoke filaments differ from smoke clouds in that they portray local air movement, while clouds show gross motion.

THE LONG-RANGE ASHVE research program in room air distribution[1] involves interesting problems of instrumentation and technique. Previous papers have reported an anemometer[2], a velocity direction probe[3], and a turbulence indicator[4]. This paper describes a method by which the velocity field in the wandering low-velocity region of room air movement has been made amenable to quantitative study with the aid of smoke-filaments for establishing velocity-vector directions. Advisory guidance has been rendered by the Technical Advisory Committee on Air Distribution†.

Smoke is a time-honored means of making air movement visible, but for quantitative purposes it is advisable to be careful in diagnosing what may be *seen* with smoke.

In the sense of fluid mechanics, a streamline is a line in a flow region whose tangent at any point is the direction of the velocity at that point. In steady motion, but not in unsteady motion, a streamline also represents a filament line, which is a line joining the instantaneous positions of all particles that have passed through a given point in the fluid.

A smoke trail from a small source is basically a conglomeration of filament lines, presenting a trace of particle paths and also illustrating the features of local swirls and billows. Although local and temporary departures from time steady flow are unavoidable in room air movement, experience has shown that practiced judgment in observing smoke fila-

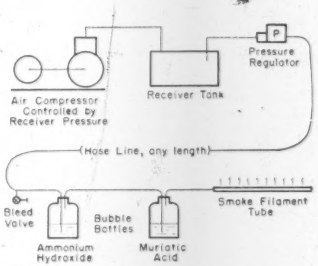


Fig. 1—Flow schematic for smoke production

*Research Associate, ASHVE Research Laboratory. Member of ASHVE.

**Research Engineer, ASHVE Research Laboratory.

[1]Exponent numerals refer to References.

Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Spring Lake, N. J., June 1952.

†*Personnel:* G. B. Priester, *Chairman;* H. F. Brinen, R. M. Conner, S. H. Downs, Linn Helander, F. B. Holgate, W. O. Huebner, W. W. Kennedy, R. D. Madison, G. E. McElroy, L. G. Miller, H. C. Pierce, C. H. Randolph, T. H. Troller, R. D. Tutt, G. L. Tuve.

ments will yield reliable time-mean velocity-direction data.

Smoke Generator and Rake‡ Tubes

Inexpensive simplicity was the practical keynote for the present studies. Ammonium chloride was a satisfactory smoke, and was generated as shown schematically in Fig. 1. Features pertaining to this were the following:

1. The discharge line from the receiver tank of the air compressor was equipped with a pressure regulator, set to maintain a pressure not exceeding 5 psig in the rubber-hose line to the smoke generator.

2. The smoke generator was moved about the test space[3] so as to always be near the position where smoke data were desired, thereby minimizing the length of the connection between the generator and the smoke tubes. A bleed connection on the line from the air compressor served as a simple means of regulating the rate of smoke generation.

3. In the generator, the air first was bubbled through a bottle containing commercial ammonium hydroxide, adjusted to a *pH* value of approximately 9. The outflow from this bottle then was bubbled through a second bottle containing commercial muriatic acid. With proper on-the-spot adjustment of the air rate and liquid levels, a dense cloud of fine white particles was produced. Improper conditions would produce either a smoke which was too weak or one in which the ammonium chloride particles were too large and sticky.

4. Smoke was emitted from rakes made out of copper tubing. This tubing was nominal 1/4-in. for short rakes and 3/8-in. for long rakes. Smoke filaments were discharged from 1/32-in. holes drilled in the tubing at either 3-in. or 6-in. intervals, as convenient, along a line parallel to the axis. In a few instances, a short piece of tubing was used to emit a single smoke trail for exploratory work. The smoke discharge always was set perpendicular to the air flow in order that motion of the filaments in the flow direction should be imparted by the flow alone.

Smoke-Filament Observations

A flash picture of an illustrative flow condition is given as Fig. 2. This is a case of a chilled jet, discharged horizontally, which has followed a falling trajectory and has reached the floor a short distance in front of the smoke tube (*right* in Fig. 2). The stream in the region of the picture is rolling along the floor. The reversal of flow direction is clearly shown, and this marks the upper edge of the *jet*. Above the *jet*, room air is flowing back toward the outlet in a stream which is entrained by the outflowing air.

A very large number of observations of smoke filaments were made during the course of the studies summarized in companion papers[5,6]. The technique was easiest in a darkened room using spotlights to illuminate the smoke. In general, rake tubes were strung in a line across the jet stream so that both edges could be seen at the same time. Observers would watch the filaments for an appreciable period of time, noting the varied peculiarities of the billowing and wandering action as well as the nature of the time-mean motion. When they were satisfied, records would be made of the most probable location of the jet edges and of the velocity-direction profile across the jet. Fig. 3 is an illustrative set of data.

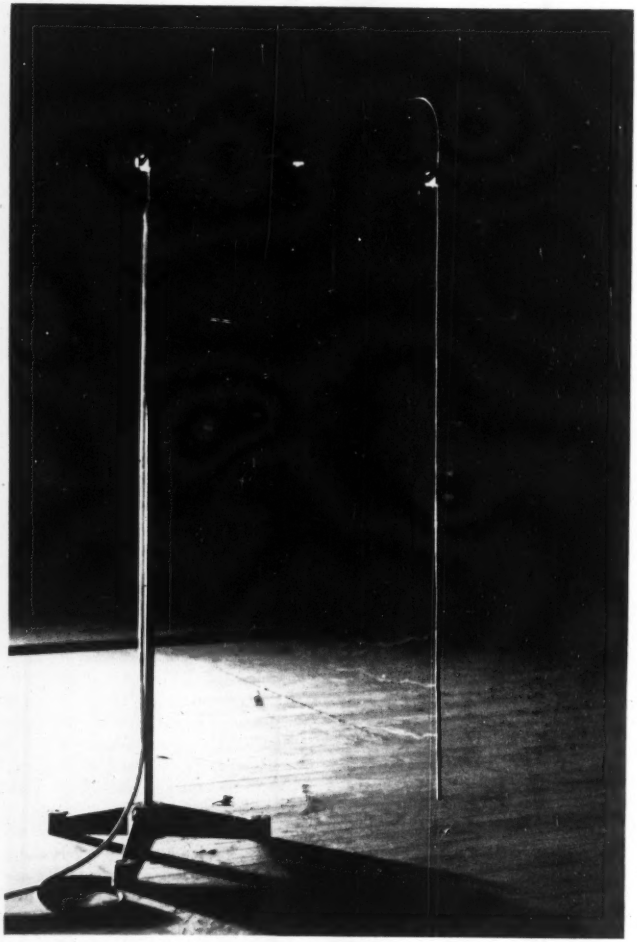


Fig. 2—Use of smoke filaments to establish velocity-vector direction pattern across upper boundary of a chilled jet which has fallen to floor

‡In the aerodynamic sense, a rake comprises a line of instruments set across a flow stream.

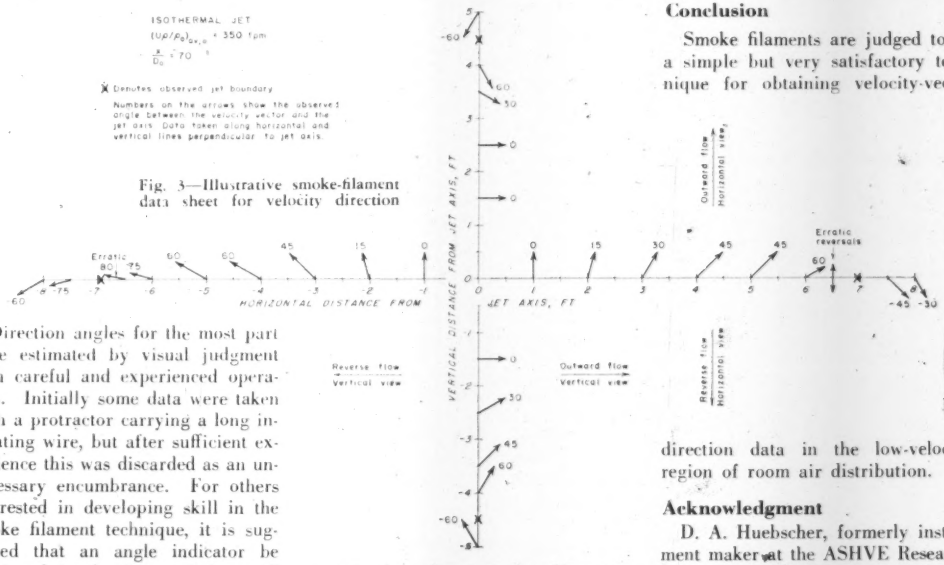

ISOTHERMAL JET
$(U_P/P_0)_{ax,o}$ = 350 fpm
$\frac{x}{D_o}$ = 70
Denotes observed jet boundary
Numbers on the arrows show the observed angle between the velocity vector and the jet axis. Data taken along horizontal and vertical lines perpendicular to jet axis.
Outward flow
Horizontal view
Erratic reversals
Erratic
HORIZONTAL DISTANCE FROM JET AXIS, FT
VERTICAL DISTANCE FROM JET AXIS, FT
Reverse flow
Vertical view
Outward flow
Vertical view
Reverse flow
Horizontal view

Fig. 3—Illustrative smoke-filament data sheet for velocity direction

Direction angles for the most part were estimated by visual judgment with careful and experienced operators. Initially some data were taken with a protractor carrying a long indicating wire, but after sufficient experience this was discarded as an unnecessary encumbrance. For others interested in developing skill in the smoke filament technique, it is suggested that an angle indicator be employed in the form of fine stiff wires set at intervals of 30 deg. This assembly should be positioned where it would not interfere with the flow in the vicinity of the filaments.

Careful attention was given to the matter of reproducibility. Checks were made between different days, repeated tests, and different observers. The results were quite satisfactory. For the range covered[5,6], jet-edge positions could be duplicated within ± 0.25 ft, and individual velocity directions could be repeated to ± 15 angular deg under the worst conditions, and considerably better than this where the flow was smooth. Establishing a velocity-direction profile across the jet required the best average curve to summarize the results. These averages were based on many readings, so that the uncertainty at any point on the profile was very much less than the tolerance on an individual spot reading. It is believed that the averaged profiles were accurate to between 5 and 10 deg at any one point.

The corresponding velocity-magnitude profiles were obtained from heated-thermocouple anemometers.[2]

Smoke filaments were limited to velocities below roughly 100 fpm for easy visual observations. In each test[5,6], data from smoke filaments were compared with readings from a V-wire direction probe[3], as a general check on consistency. Motion pictures would have been a very instructive method of recording smoke-filament behavior as an aid to a more detailed diagnosis of the flow phenomena. This, however, was beyond the present scope.

Ammonium chloride was found to be an unobjectional smoke so long as the particles were kept small and the quantities kept within reason. The particles did have a trace of acid carry-over so that judgment was necessary in use.

The inadequacy of smoke clouds for obtaining velocity direction profiles can be readily appreciated. Smoke clouds also were poor for establishing jet edges because: (1) the rate of turbulent mass transfer is slightly greater than the rate of turbulent momentum transfer, whereby cloud edges give a jet that is generally wider than the true velocity boundaries; (2) the billowing and wandering nature of the flow makes cloud edges quite vague; and (3) clouds involve such quantities of smoke that the entire space soon becomes smoke-laden to the nuisance point.

Conclusion

Smoke filaments are judged to be a simple but very satisfactory technique for obtaining velocity-vector direction data in the low-velocity region of room air distribution.

Acknowledgment

D. A. Huebscher, formerly instrument maker at the ASHVE Research Laboratory, aided in the initial development of the smoke-filament technique. This paper is based upon part of a thesis submitted to the Graduate Division of Case Institute of Technology by the senior author; the guidance of Professors G. L. Tuve, S. D. Black and L. G. Seigel is gratefully acknowledged.

References

1. ASHVE Research in Air Distribution and Air Duct Friction, by Cyril Tasker (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, Vol. 20, April 1948, p. 125).

2. A Simple Heated-Thermocouple Anemometer, by H. B. Nottage (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, Vol. 21, April 1949, p. 115).

3. A V-Wire Direction Probe, by H. B. Nottage, J. G. Slaby and W. P. Gojsza (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, April, 1952, p. 123).

4. Outlet Turbulence Intensity as a Factor in Isothermal-Jet Flow, by H. B. Nottage, J. G. Slaby and W. P. Gojsza (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, May 1952, p. 117).

5. Isothermal Ventilation-Jet Fundamentals, by H. B. Nottage, J. G. Slaby and W. P. Gojsza (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1952, p. 165).

6. Exploration of a Chilled Ventilation Jet, by H. B. Nottage, J. G. Slaby and W. P. Gojsza (to be published).

Status of the Heat Pump in the Southeast

By S. L. Pappas* and F. R. O'Brien**, Birmingham, Ala.

SUMMARY—Over 125 heat pump installations in the Southeast were surveyed and data were collected regarding design, initial cost, operating expenses, and maintenance. A customer poll indicated a generally favorable reaction to comfort conditions and operational cost. The majority of units were the package type, with water as the predominant heat source, followed by air. Ground coils were limited, only two units being reported. A reasonable correlation is indicated between heat pump performance and degree days of operation.

THE PURPOSE of this paper is to present a current report of the heat pump situation, particularly in the Southeastern states, which include West Virginia, Virginia, Tennessee, Alabama, Georgia, Mississippi, and Florida. To compile such a report, a survey was made of as many heat pump installations as possible. Information was obtained about design features of the various installations, operating data (such as energy consumption figures), house size and construction, initial, operational, and maintenance costs, and, most important of all, the owner reaction to such considerations as comfort, noise, operating expenses, etc.

The first step in the project was to contact all the power companies in the Southeast and obtain a complete list of heat pumps installed on their lines. Arrangements were then made to visit each installation.

Both residential and commercial heat pumps are included, since both offer good outlets for the heat pump. The majority of installations, however, are residential.

Heat Sources

Well water, river water, spring or pond water, and air are the heat pump heat sources used in the Southeast. With two or three exceptions, ground coils are not used. Of all the heat sources, well water has by far the greatest number of applications. The two common methods of using well water in the Southeast are: (1) by pumping the water from the well and passing it through the heat pump evaporator; and (2) by using a U-tube immersed in a well, and circulating water or an antifreeze solution through the U-tube to pick up heat from the well water. The latter method is applied essentially in the Chattanooga and TVA regions, while the use of well water directly is common in most of the other states from Florida to Virginia.

One of the greatest advantages of using well water as the heat source is that its temperature will remain relatively stable the year round. The heat output of any heat pump is dependent upon the heat source temperature. The higher the temperature, the greater is the heat output. Thus, if a heat pump uses a heat source that will drop with the outside air temperature, the heat output decreases as the heating requirements increase. The ideal situation is to have the heat source temperature increase with decreasing outside air temperature. However, as this obviously is not practicable, the most suitable heat source is that having the highest temperature and greatest stability. Well water meets these conditions as well as any of the heat sources used by the heat pump.

Use of water directly from the well is more common than the use of the U-tube, because good underground water flow is required with U-tube installations to maintain a fairly constant well water temperature.

Use of water directly from the well presents the problem of corrosion and cleaning, since many of the wells have high sulfur and iron content. The question of ample water supply also is one that has to be considered. Water conservation practices, such as drilling a second well for returning the well water, or using a cooling tower during the cooling season, are being applied in some installations. The average size water pump used with 3 and 5-hp heat pumps is 1 to 1½ hp.

Use of a U-tube in a well with a circulating medium flowing through it in a closed system, if properly applied and if a good underground flow exists, is a good and reliable method of heat source design. To prevent any freezing in the U-tube circuit, use of an antifreeze solution is definitely recommended in a U-tube installation.

Only 100 to 150 ft of tube heat transfer surface are required per ton of capacity, in the Chattanooga and TVA regions. This is much less than the average ground coil installation which usually requires 300 to 600 ft of ground coil per ton of capacity.

No corrosion or cleaning problems of any magnitude are present with the U-tube, and the pumping requirements are smaller. The average size U-tube circulating pump used on the 3, 5, and 7½-hp units is ¾ hp. Depth of the well required with the U-tube is usually greater than that required for wells supplying water direct to the heat pump.

Spring or pond water is used successfully as a heat source as long as the water does not drop below about 45 F. Three installations in Georgia and Florida use spring-fed pond water directly. Two installations in Chattanooga use a coil immersed in a pond and circulate water or an antifreeze solution through the coil to pick up heat from the water in the pond. The average coil length used per ton is about 350 ft, which is less than for the average ground coil.

River water is used as a heat source in two installations in Alabama.

*Research Engineer, Southern Research Institute.

**Assistant Director, Southern Research Institute.

Water is pumped from the river through the heat pump heat exchanger coil. Temperature of the river water usually will be affected more by weather conditions than spring or pond water. Water temperatures as low as 42 F were experienced during the 1950-51 winter in the Alabama installations and caused some freezing in the evaporator and a marked loss of heat output.

The maintenance problem, especially for cleaning the heat exchanger coil, is always a consideration when river water is used, even if the water is filtered before it goes to the heat pump.

Air is second in use as a heat source in the Southeast and is the cheapest and easiest to obtain. It has one disadvantage in that, as the heating requirements of a home or building increase, the heat output of the air heat pump decreases due to decrease of the heat source temperature. In addition, the coefficient of performance decreases with a drop in heat source temperature. It has one great advantage, however, in that the air-to-air heat pump does not require a well, ground coil, or a pond of water, and thus some installation cost is saved.

Air will work well as a heat source until the outside air temperature drops to about 38 F. After this, frost begins to form on the outside air heat exchanger and acts as an insulator which reduces the transfer of heat from the air to the refrigerant, thereby lowering the heat pickup and the heat output. To remedy this, the defrost cycle must be activated to remove the frost from the coil. It is difficult to maintain the coil completely free of frost at all times, since it is not feasible to activate the defrost cycle every 15 or 20 minutes. In addition, the lower heat level of the air causes a smaller amount of heat extraction and lowers the heat output.

Past experience in the Southeast has shown that any air-to-air heat pump which is properly sized and installed can handle the heating requirements of a house or building until the temperature drops below 20 F — if the unit is properly adjusted and is carrying a full charge of refrigerant, and if the defrost mechanism is functioning properly. Below this temperature, the air-to-air heat pump may have difficulty maintaining comfortable house or office temperatures, unless it is highly oversized. In such states as Tennessee, Alabama, Georgia, North Carolina and South Carolina, Mississippi and Florida, however, there is only a small percentage of the time during the average heating season that the temperature will be below 20 F for any length of time. This condition makes the air-to-air heat pump a good application for this section.

One method of remedying the lower capacity of the air-to-air heat pump during low outside air temperatures is to use the storage principle or to provide for some form of supplemental heat. The storage principle is used in some of the West Virginia and Virginia installations and involves the storage of heat in a water tank by the heat pump during *off operation* periods and its utilization during the extreme conditions. Although Florida is the leading Southeastern state with air-to-air heat pumps, West Virginia (which has a most severe winter climate), Virginia, Tennessee, Georgia, and Alabama have a number of air-to-air units that are performing well.

Supplemental Heat

It is common practice in many of the heat pump installations in the Southeast to install some form of supplemental or standby heat, to insure comfort in case of extreme weather or in case of breakdown. This is one provision that many engineers and contractors have insisted upon as necessary, because the heat pump is usually sized very closely, or with no safety factor at the design conditions. In some installations, heat pump design temperatures are 5 to 10 deg higher than customary because of the short period that temperatures will be below the selected design temperature. In such cases, it is almost imperative that some form of standby or supplemental heat be available. Supplemental or standby heat is not as important with a well water heat pump as it is with an air-to-air heat pump, for obvious reasons.

Not many of the customers covered by the survey objected to, or have lost any confidence in, the heat pump because of the supplemental heat. Most of them feel that it is installed for breakdowns, rather than for supplementation purposes. This attitude is to the advantage of the heat pump. In a majority of the cases, the supplemental heat is supplied by electric strip heaters which usually are installed in the duct system and controlled by a separate thermostat. Some installations have portable electric heaters which are moved from place to place, with the bathroom one of the most popular locations. In one or two installations, a gas furnace supplies supplemental heat, and, in many older homes, the previous heating plant is kept for standby or supplemental use.

Supplemental heat was found in the following approximate percentages of installations: Chattanooga region, about 58; Georgia, 7; Florida, 7; Virginia, 33; and West Virginia, about 90. The West Virginia region has a large number of air-to-air units and also the severest winters, increasing the necessity for supplemental heat.

In Virginia only 20 percent of the people having supplemental heating equipment had occasion to use it, while 57 percent needed it in Chattanooga. In West Virginia, almost all have had to use their supplementary heaters, while only a very small percentage have required them in Georgia, Alabama, and Mississippi.

Heat Pump Homes

The question usually arises as to what types of homes have heat pumps, that is, whether they are old or new, large or small, etc. The division is about even between old and new homes in the Southeast. In Chattanooga, 58 percent of the installations are in old homes and 42 percent are in new ones. Corresponding percentages for various states are: Georgia, 67 and 33; Virginia, 57 and 43; Florida, 61 and 39; and West Virginia, 70 and 30.

From these figures, it is obvious that the new home builder is not the

Table 1—Average Cost of Heat Pump Installations in the Southeast

Size—Horsepower	Dollars
3	3265
5	4079
7½	5020
10	6438

only good heat pump prospect, although the new home is ideal because the structure can be designed for heat pump application. The older home presents a more difficult situation because many adjustments and changes may be required before a heat pump can be installed properly. The need for more insulation and weatherstripping, new ductwork, new grilles or duct outlets, and wiring are some of the problems encountered with older homes. In many older homes, original air outlets and some of the original supply and return ducts are used, thus lowering installation costs. The comfort reaction to cooling in old homes employing the same floor and baseboard outlets was found to be good in this survey, since no owner complained of drafts.

Sizes and types of homes in which heat pumps are installed in the Southeast vary from a colonial mansion over 100 years old, in Virginia, to a small, 4-room wood frame house in Florida. In general, a small, 6-room house that is properly insulated can be handled by a 3-hp heat pump and a medium sized 7 to 8-room house can be handled by a 5-hp heat pump. The 3-hp and 5-hp heat pumps are predominant in the Southeast.

New home installations usually produce the most satisfied users; however, old home installations can be just as satisfactory, if the application is properly engineered.

Initial Cost Data

Total initial cost of any heat pump (including installation costs) is affected by a number of factors. The chief factors affecting the installation cost of the heat pump using well water as the heat source will be the depth of the well required, soil conditions in the locality, and pump size.

For a heat pump using air as the heat source, the duct-work required will usually have the greatest effect on installation cost. The cost of the air-to-air heat pump unit proper is usually a little higher than that of a same size water-to-air heat pump. This does not include installation costs.

When the ground is used as a heat source, the initial cost of laying a ground coil usually increases the installation cost considerably.

The average total cost of the various sizes of heat pumps (including installation costs) in the Southeast is shown in Table 1.

While the costs in Table 1 may seem high, it should be remembered that a person buying a heat pump must want summer cooling along with winter heating to make these prices justifiable. If the owner were to buy two separate units, one for heating and one for cooling, the cost of the heat pump would probably compare favorably with the combined cost of the two separate units functioning to do the same job and occupying more space. Most of the customers included in the survey felt that the cost of the heat pump was somewhat high but many believed that it was justifiable since the heat pump replaces two separate units.

In coastal areas such as Jacksonville, Fla., and Savannah, Ga., well-water units are usually installed at lower prices than inland, because well drilling in these localities is less expensive. In Jacksonville, for instance, a well is dug for about $100, as compared to $500-$1000 in some sections of Alabama, Tennessee, West Virginia, and Virginia.

Table 2—Average Annual Energy Consumption for Heating and Average Heating Requirements

Region	Kwhr per year		Avg. Dec Days for Region
	3 hp	5 hp	
West Virginia	6802	13091	4300
Virginia (South Va.)	7253	11819	3400
Chattanooga	8574	13248	3200
Georgia (South Ga.)	5564	7613	1900
Florida (South Fla.)	2591	3521	800

Table 3—Average Annual Cost of Heating with the Heat Pump

Region	Dollars per Year					
	1½¢/kwhr*		2¢/kwhr		2½¢/kwhr	
	3hp	5hp	3hp	5hp	3hp	5hp
West Virginia	102	196	136	262	170	326
Virginia	109	177	145	236	181	295
Chattanooga	129	199	172	266	215	331
Georgia	84	114	112	152	140	190
Florida	39	53	52	71	65	88

*The 1½ cent rate applies to practically all the units in the Southeast.

Table 4—Average Annual Energy Consumption for Cooling with Heat Pump

Region	Kwhr per Year	
	3 hp	5 hp
West Virginia	2748	4509
Virginia	3643	7916
Chattanooga	3020	3305
Georgia	2201	3401
Florida	5606	12275

Energy Consumption

The heating requirements of any locality are based upon the degree days. Consequently, the energy consumption of any heat pump is largely a function of degree-day heating requirements.

The average annual energy consumption values for heating with the 3 and 5-hp heat pumps in the various regions and their respective average degree-day heating requirements are shown in Table 2.

It is obvious from Table 2 that the energy consumption increases with degree-day heating requirements. The West Virginia, Virginia and Chattanooga regions do not conform to this rule, because the living habits of the heat pump owners will affect energy consumption more than the difference in degree days. When the difference in heating requirements is large, the energy consumption should correspond to the degree-day value.

The average annual costs of heating with the 3 and 5-hp heat pump for the various regions is shown in Table 3 (based upon charges of 1½, 2, and 2½ cents per kwhr with no demand charge).

The average annual energy consumption on cooling with the 3-hp and 5-hp heat pump for the various regions is shown in Table 4.

Florida has the greatest cooling requirements, as might be expected. Not much variation exists in the

Table 5—Average Annual Cost for Cooling

Region	Dollars per Year					
	1½¢/kwhr		2¢/kwhr		2½¢/kwhr	
	3 hp	5 hp	3 hp	5 hp	3 hp	5hp
West Virginia	41	68	55	91	68	113
Virginia	55	119	71	159	88	198
Chattanooga	45	50	60	67	75	83
Georgia	33	51	44	68	55	85
Florida	84	184	112	246	140	306

cooling power consumption for the various regions north of Florida. This is probably due to the living habits of the occupants, since many do not use the cooling side until the weather gets very hot, while others may operate the heat pump continuously.

The average annual cost for cooling in the various regions with the 3 and 5-hp heat pump is shown in Table 5. From Tables 3 and 5, the average annual cost of operating the heat pump (heating and cooling) in the various regions is shown in Table 6. Table 7 shows the overall average cost of operating (heating and cooling) the 3-hp and 5-hp heat pump in the Southeast.

Table 6—Average Annual Cost of Operating Heat Pump

Region	Dollars per Year					
	1½¢/kwhr		2¢/kwhr		2½¢/kwhr	
	3hp	5hp	3hp	5hp	3hp	5hp
West Virginia	143	264	191	353	238	440
Virginia	162	296	216	395	270	493
Chattanooga	174	249	232	332	290	415
Georgia	117	165	156	220	195	275
Florida	123	237	164	316	205	395

All of the units covered by the survey are normal operating units. None are instrumented to the extent that the *coefficient of performance* or *performance factor* can be calculated. To get some comparison of the operating qualities of the various installations on heating, it is necessary to devise a suitable term. If the average annual energy consumption on heating is divided by the connected horsepower and average degree days for each region, a term is obtained that gives the *kilowatt hours* of consumption *per horsepower per degree day*. This term is calculated for each region and is plotted in Fig. 1 against average degree days for the 3 and 5-hp units. It shows a marked decline with an increase in degree day heating requirements (the Chattanooga region is a little out of line) which indicates that the average heat pump operates more efficiently as the heating requirements of a region increase. Past experiences at the *Southern Research Institute* with thoroughly instrumented heat pumps, especially as

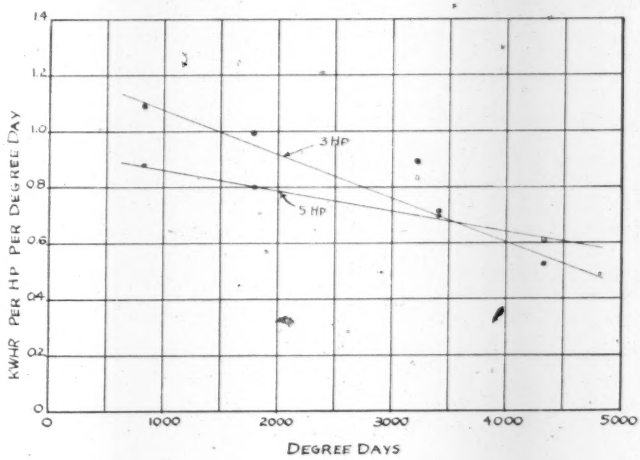


Fig. 1 — Relation of heat pump energy consumption to degree days

pertaining to *coefficient of performance* or *performance factor* provide some explanations. It was found that the *performance factor* of a unit is not good if a unit is operating intermittently or short cycling. During this type of transient operation, as the heat pump is about to attain a reasonable *coefficient of performance*, which takes a few minutes, it is cut off, and the overall *performance factor* for that short period of operation is very low. In the more southerly regions, especially in Florida, Georgia, Alabama, Tennessee, and Mississippi, this type of operation is experienced quite frequently because of the milder climate. As the heating requirements increase, such inefficient operation becomes less frequent.

Customer Reaction

Possibly the most important result of this survey is the reaction of the heat pump owner to comfort conditions, operating costs and maintenance costs. Each customer was asked whether he would buy another heat pump if he were selecting a system again, and 85 percent answered *yes*, without reservation.

In regard to comfort, 73 percent of the heat pump owners said that this was excellent. A small percentage are not satisfied with comfort, and, in many such cases, the heat pump installation is either undersized, the system design defective, or the service very poor. The balanced form of heat that the heat pump supplies is appealing to most of the customers, and many, including two doctors, stated that the percentage of winter colds in their families had been cut down considerably. The lower discharge-air temperature does not appeal to some people, who have been accustomed to a very warm house. It is only a matter of time, however, before they will become acclimated to the heat pump conditions. There were some complaints of noise due to stopping and starting and air duct noise, but these would be encountered in any forced air conditioning system.

Table 7—Overall Average Cost in Dollars for Operating the Heat Pump in the Southeast

1½¢/kwhr		2¢/kwhr		2½¢/kwhr	
3 hp	5 hp	3 hp	5 hp	3 hp	5 hp
144 per yr 12 per mo	242 per yr 20 per mo	192 per yr 16 per mo	323 per yr 27 per mo	239 per yr 20 per mo	403 per yr 34 per mo

The reaction to maintenance cost is good, since none of the units incurred large maintenance expense, with two or three exceptions. Customers were asked to compare the cost of operating the heat pump for heating only to their previous heating system, or to any other heating system. This is an unfair question to ask a person who has moved into a new dwelling, since he has had no previous experience with any other system in the house. In practically every case, however, the customer had formed some opinion, and 58 percent thought that operation was cheaper with heat pump operation than with other types of heating systems. This is encouraging, as many of the previous heating systems were coal and gas furnaces with which it is difficult to compete economically. It also should be remembered that less than 10 percent of the installations included in this survey are in Chattanooga, which has lower power rates than other sections of the Southeast.

Conclusions

The results of this survey reveal many interesting facts about heat pump installations in the Southeast and they are most encouraging. Well over 90 percent of the heat pumps installed in the Southeast are doing the job of heating and cooling in a satisfactory manner. The cost of operating the heat pump compares very well with other types of heating, as shown by the majority of the heat pump owners.

The initial cost is high. However, if the combined costs of a heating unit and cooling unit be compared with the heat pump cost, it should compare favorably. Lower installation costs (including cost of unit) will be required before the heat pump will take its place as a conventional heating and cooling plant.

Both new home and old home owners are equally good heat pump prospects. Good service facilities must be provided with each heat pump in order to have a satisfactory installation.

Acknowledgment

This project was under the sponsorship of Southern Services, Inc. of Birmingham, Ala.

Honored by Life Membership

F. F. Dodds, Kansas City, Mo.—Manager of sales, American Radiator and Standard Sanitary Corp., was born on May 8, 1887 in Quincy, Ohio. He attended Miami University in Oxford, Ohio, and obtained his early experience with the National Cash Register Co. and the Platt Iron Works in Dayton, Ohio. On January 1, 1913 he joined American Radiator as a salesman in Chicago. He was transferred to Kansas City in January 1914 and became assistant sales manager there in 1920. He was made Kansas City sales manager in 1924, a position he still holds today.

F. F. Dodds
Kansas City, Mo.

Mr. Dodds joined the Society in 1920 and has served as president of the Kansas City Chapter.

Mr. Dodds is a past president of the *Builders Association* of Kansas City and the Rotary Club. He has served as a director of the Chamber of Commerce and today is serving his thirteenth year as president of the Kansas City Blue Cross Hospital Service.

L. Logan Lewis, Syracuse, N.Y.—Vice President of Carrier Corp., was born on April 16, 1887, near Lexington, Ky. He graduated from the University of Kentucky in 1907 with a B.M.E. degree and received his M.E. from the same school two years later. He joined the Carrier Air Conditioning Co. in 1909 as an engineer. In 1915 he was one of a group of seven men who organized the Carrier Engineering Corp. and he became chief of application engineering, secretary and director of the corporation. He became vice president of Carrier in 1936, in which capacity he is presently engaged.

Mr. Lewis pioneered in a new system of auditorium and theater air cooling and distribution and helped bring about a spectacular growth in this application of the young industry. He is the author of many papers.

L. L. Lewis
Syracuse, N.Y.

He became a member of the Society in 1918. Mr. Lewis has been a member of *ASRE* since 1919 and served as chairman of the New York Section in 1922. He was elected national president of *ASRE* in 1940. He was a member, Sub-Committee on Armored Vehicles, Nat'l. Research Council, and belongs to the Technology Club, Syracuse.

T. W. REYNOLDS, Riviera Beach, Fla. —Technical writer and consulting engineer, was born in Amsterdam, N.Y. on August 4, 1885. Attended Union College in Schenectady, N.Y., and evening school at Columbia University.

He has been a contributor to many technical journals and periodicals in this country and Canada for 40 years and today serves as technical consultant to *Heating and Ventilating* and as consultant to Roeder Engineering Co., Miami, Fla., and Abbott Merkt Co. in New York.

T. W. Reynolds
Riviera Beach, Fla.

He has been with many companies as a mechanical engineer. Among these were General Electric in Erie, Pa., New York Central Railroad, and Walter Kidde Constructors, New York. He assisted in designing the air conditioning for the Perisphere and other buildings at the 1939 New York World's Fair and during World War II served as a consultant to the War Production Board.

Summary of Chapter Meetings

SOUTHERN PIEDMONT CHAPTER HOLDS ORGANIZATION MEETING

The organization meeting of the Southern Piedmont Chapter of the Society, with headquarters in Charlotte, N. C., was held on Friday, March 28, 1952, at the Selwyn Hotel, Charlotte, N. C. After a social hour and dinner, the meeting was called to order by R. M. Warren, Jr., temporary chairman, who appointed J. A. Rice as acting secretary.

Through the efforts of R. S. Fullerton, a set of by-laws was presented to each member. The acting secretary read the by-laws, section by section, and each was voted upon and approved, and signed by each of the 14 members present, the approved copy being retained for the chapter records.

Chairman Warren announced the appointment of the nominating committee as follows: K. W. Selden, Jr., chairman; R. O. McGary, and B. A. Leppard. After a recess, the meeting was resumed and Chairman Selden presented the slate of officers, and on motion of M. H. Violette, seconded by Mr. Petty, the following officers were elected: *President*—R. M. Warren, Jr.; *Vice President*—R. E. Mason; *Secretary*—J. A. Rice; *Treasurer*—J. W. Barr; *Board of Governors*—R. O. McGary, W. H. Reed, III, and K. W. Selden, Jr.

On motion of Mr. McGary, seconded by Mr. Reed, it was voted that the May meeting be selected as *Charter Night* and that all members, including those whose applications had been processed and/or pending before the Society would become charter members of the Southern Piedmont Chapter.

L. F. Lawrence, Jr., chairman of the membership committee, reported that 7 applications had been sent to the Society's headquarters office, 8 were being processed in the Chapter, and 12 applications were requested by guests in attendance at this organization meeting. The meeting adjourned at 10:30 p.m.

PRESIDENT SZEKELY PRESENTS CHARTER TO NEW BRITISH COLUMBIA CHAPTER

Ernest Szekely, Milwaukee, Wis., president of the ASHVE, presented the Charter and record books to the newly organized British Columbia Chapter of the Society, with headquarters in Vancouver, B. C., at its meeting on April 9, in the Quadro Club.

Following the presentation, President Szekely traced the growth of the Society since its founding in 1895, and outlined its activities in spearheading many of the fundamental advances in the heating, ventilating, and air conditioning field, and its contribution to the needs and interest of the people.

Ernest Szekely

President Szekely then addressed the newly organized chapter members on *The ASHVE—Comfort Engineers.*

The first officers to serve the British Columbia Chapter were elected as follows: *President*—M. E. Minaker; *Secretary*—D. W. Thomson; *Program Chairman*—R. St. John Maw.

Congratulatory messages were received from many of the Chapters in the Society, and were read by D. W. Thomson, along with the minutes of the preceding organization meeting, which were approved as read. A report of the by-law committee was given by Robert McDonnell, who stated that a draft of the by-laws would be sent to various members before the next meeting.

Stanley Gale reported that there had been an increase of about 11 since the last meeting, and after a few announcements concerning the May meeting, the meeting was adjourned at 9:15 p.m.

Massachusetts Chapter Officers and speakers at April meeting (*l. to r.*) D. W. Blair, past president, John Bonner, president, the speakers, H. E. McGregor, F. J. Butler, J. N. Fowler, and L. B. Mann; G. B. Torrens, vice president, A. L. Hare, treasurer, and L. R. Geissenhainer, secretary

MASSACHUSETTS CHAPTER HAS DISCUSSION ON ENGINEERING OPPORTUNITIES AND PROSPECTS

Pres. John Bonner opened the April 15 meeting of the Massachusetts Chapter in the Campus Room, Graduate House, at MIT, Cambridge, and announced the results of the election of officers as follows: *President*—G. B. Torrens; *Vice President*—A. L. Hare; *Treasurer*—G. W. Sprague; *Secretary*—G. D. Fife. *Board of Governors*—G. W. Sprague, G. E. Fickett, and M. I. Kishler. The three members elected to the board of governors were elected for a term of three years, to fill the vacancy caused by the three retiring members.

It was voted by the board of governors to retain T. F. McCoy's name on the chapter rolls even though Mr. McCoy is now living in Florida. Mr. McCoy is a Life Member of the Society and has been a member of the Massachusetts Chapter since 1913.

This meeting was planned by the Chapter's program committee as a special meeting to interest those who are studying and training for careers as heating and ventilating engineers. D. W. Blair, past president of the chapter, introduced the speakers and announced the topic each would discuss as follows: *Teaching*—F. J. Butler, design engineer, Buerkel & Co., Inc. and teacher of heating and ventilating, Franklin Technical Institute, Boston, Mass.; *Engineering*—J. N. Fowler, chief of Mechanical Section, New England Division, Corps of Engineers, U. S. Army; *Sales*—L. B. Mann, vice president, Boston Filter Co., Inc., Charlestown, Mass.; *Contracting*—H. E. McGregor, treasurer, Power Piping Corp., and president of the *Heating, Piping and Air Conditioning Contractors National Association.*

The speakers discussed the opportunities and prospects in the different fields for the students in local schools who are preparing to enter the engineering profession. At the conclusion of the talks an interesting question and answer period was conducted, and the meeting was adjourned at 10:00 p.m. Attendance 62.

• *MASSACHUSETTS*—May 20, 1952. Following a board of governors meeting, a social hour and dinner was held in the Campus Room of the MIT Graduate House. The minutes of the April meeting and the treasurer's report were read and approved immediately after the business meeting was called to order. The following new officers were installed: *President* — G. B. Torrens. *Vice President* — A. L. Hare; *Secretary* — G. D. Fife; *Treasurer* — G. W. Sprague. Dean L. E. Seeley, past president of the Society, presented a Life Membership Certificate to F. R. Ellis. Retiring Pres. John Bonner

Discussion period at April meeting of Massachusetts Chapter

presented a past president's pin to D. W. Blair, Chapter president for 1950-51, and incoming President Torrens presented the past president's pin to Mr. Bonner for 1951-52.

P. N. Rugg, president of the *Engineering Societies of New England*, spoke on the aims of the organization, particularly as they apply to the affiliated societies. Mr. Rugg also spoke on the importance of the individual engineer taking a greater part in civic affairs. Attendance 44.

Members of Southwest Texas panel discussion (*l. to r.*) Jack Cox, A. E. Hancock, D. E. Locher, W. E. Long, E. S. Zucht, J. L. Dickson, Tom Coghill

SOUTHWEST TEXAS CHAPTER HAS ROUND-TABLE DISCUSSION

With Austin the host city, the Southwest Texas Chapter had members of the building and code departments representing Austin, San Antonio and Corpus Christi, as guests at their April 24 meeting held at the Hitchin' Post.

Following Pres. W. E. Long's report on the short course meeting relative to tropical housing, F. B. Frazee reported on the progress of advisory work done with the Attorney General's Office on clarity of the term *air conditioning*.

The meeting was thrown open to a round-table discussion of the many problems involved in the heating and air conditioning profession and industry today, especially in the Southwest Texas area. Among the points stressed was the fact that heating and air conditioning had grown to such size as to now warrant separate city inspectors to supervise installations, these men to be selected on the basis of their educational and field training in mechanical engineering.

A. E. Hancock, electrical inspector of Austin, declared that most Texas cities are growing so fast it is alarming to see the overload power users put on the lines in their homes and business establishments; he further explained that owners could not receive full service from window refrigerated air conditioners that operate on 115 volts, but felt 220 volts on proper wiring would aid efficiency and give the equipment longer life.

Tom Coghill, city engineer of San Antonio, showed the need of closer cooperation between the city inspection departments and ASHVE members regarding codes that adequately cover safety, economy and operation of heating and cooling equipment, with strong emphasis on safety.

D. E. Locher, representing Corpus Christi, explained the code governing air conditioning used in Detroit, Mich., and suggested it be a pattern to follow in Texas.

J. L. Dickson, director of public works, San Antonio, explained how qualified engineering plus proper city inspection is the best guarantee of good heating and air conditioning results. Among the most important items for close consideration are: sizing of equipment, location, wiring, piping, venting, ventilation and controls.

W. J. Brinkmann suggested that the power company stabilize its charges for power service when three phase is needed, while D. F. Schuett, Austin, recommended higher inspection fees and insistance upon inspectors giving all jobs a proper test.

Jack Cox, plumbing inspector of Austin, explained that contractors' own men could connect gas lines if they were properly bonded.

W. H. Luedecke, Austin, challenged the need for extra gas shut-off on equipment when a gas cock is built-in by the manufacturer, and suggested the City publicly announce when a code meeting is to be held so that all interested people could attend.

Earl Zucht, assistant city attorney of San Antonio, advised the ASHVE to draw up good suggestions and then

Members and guests at April meeting of Southwest Texas Chapter in Austin

Arkansas Chapter Officers

E. N. Pettit, Jr.
President

Herman Cumnock
Vice President

R. E. Blaylock
Secretary- Treasurer

W. J. Franklin

retain legal counsel to word the phrasing so doubts as to intent will be eliminated, and then submit finished codes in proper form to the various city councils.

H. J. Faller, San Antonio, pointed out the growth of the heating and air conditioning industry in Southwest Texas, and requested that the City officials establish a separate inspection department solely for this field and that personnel be appointed who have had the education and field background required to give the contractor a practical inspection. This would put the entire inspection to one man instead of two (plumbing and electrical).

I. W. Wilke, Austin, requested the Chapter Code Committee to investigate various city codes and report their findings at the next meeting.

Prof. W. E. Long, president of the chapter, in bringing the discussion to a close, offered the full cooperation of the members to advise city officials on current information for codes on heating and air conditioning, although he explained that it was outside the functions of the Society to formulate or sponsor codes. Attendance 40. Attendance ratio 0.21.*

• *SOUTHWEST TEXAS* — May 20, 1952. The meeting was called to order by Pres. W. E. Long in the Banquet Room of the Plaza Hotel, San Antonio. The minutes of the previous meeting were read and approved as corrected. It was voted to have a picnic in place of the June meeting and the following were appointed on the committee to handle arrangements: H. J. Faller, *chairman;* L. N. Mathis, and L. H. Hornor. President Long requested that the Chapter members prepare at least three papers for delivery at the annual October short course. C. H. McLeod and F. B. Frazee volunteered to present papers on *Bakery Refrigeration* and *Chilled Water Application*, respectively, while W. J. Brinkmann stated that he would choose a subject later.

G. F. Landgraf, vice president of Trion, Inc., McKees Rocks, Pa., spoke on *The Development and Functions of Electrostatic Precipitators.* Attendance 28. Attendance ratio 0.30.

• *ATLANTA*—April 14, 1952. The meeting was called to order in Harris' Tea Room, following a social hour and dinner. The minutes of the previous meeting were read and approved, and Pres. F. A. Player requested that J. N. Voorhees, publicity chairman, investigate the possibility of publishing announcements of Chapter meetings in the local newspapers. G. B. Hightower, of the code committee, in reporting on the progress of the Atlanta Heating and Ventilating Code, stated that the sections covering air conditioning, refrigeration, steam and hot water heating had been completed and that the entire code should be completed within six months. J. S. Edgar, program chairman, announced that the May meeting would be a social affair, to be held on May 30 at the Piedmont Driving Club.

Mr. Edgar then introduced Frank Hudson of Spotswood Parker & Co., who spoke on *The Development of Flame Failure Controls.* Along with the talk, Mr. Hudson demonstrated the operation of actual flame control apparatus. Attendance 47. Attendance ratio 0.39.

• *BALTIMORE*—May 21, 1952. Following a social hour and dinner, Pres. W. P. Flanigan called the annual meeting of the Chapter to order. The guests of the evening were then introduced, and reports were given by the chairmen of the program, auditing, entertainment, membership and attendance committees.

The following officers were elected for the year 1952-53: *President* — E. R. Kent; *Vice President* — H. D. Glaser; *Secretary* — A. M. Kroft; *Treasurer* — C. J. Peters; *Board of Governors* — J. E. Seiter, R. L. Hughes, Jr., and W. P. Flanigan. Retiring President Flanigan thanked the officers and committee chairmen for their cooperation and turned the gavel over to incoming President Kent. President Kent thanked the membership for the honor of being elected president and briefly outlined the Chapter's history, placing special emphasis on the efforts of E. L. Crosby, G. B. Priester and Mr. Flanigan on behalf of the Chapter. President Kent then presented Mr. Flanigan with a past president's pin.

J. A. Cameron, Jr., vice president, The Marley Co., New York, N. Y., spoke on *Cooling Towers, Their Op-*

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

eration and Application. The function of cooling towers and their necessity in conservation of water were discussed, and it was added that legislation in most cities requires cooling towers. Mr. Cameron stated that a 10 deg temperature differential was most commonly designed for cooling towers using a 78 F wet bulb in Baltimore. He also explained that there are two general types of mechanical draft cooling towers, forced and induced, with the induced broken down into the cross-flow type with a free area of 90 percent and the counter-flow type with a free area of 65 percent, and then went on to discuss each. Slides were used to illustrate the talk. Attendance 50. Attendance ratio 0.46.

• *BALTIMORE*—April 23, 1952. Members and guests met in the Engineers Club of Baltimore for a social hour and dinner, following which Vice Pres. E. R. Kent introduced the guests, who included Ray Strong, registrar, University of North Carolina, and C. W. Spraugh, H. G. Muller and F. M. Thuney, all of Minneapolis-Honeywell Regulator Co., Washington, D.C. Vice President Kent then presented the treasurer's report and called on E. J. Morris, nominating committee chairman, to present the slate of nominees for officers for 1952-53. The auditing committee was appointed as follows: J. E. Seiter, E. S. Berngartt, and C. J. Peters.

Stanley Stacheleck, Engineering Division, Owens-Corning Fiberglas Corp., Toledo, Ohio, spoke on *Insulation at Low Temperatures.* Mr. Stacheleck stated that next to the Gulf Coast area, Baltimore is the highest humidity area in the country. Although a 0 F winter design temperature is used, 15 years of study have indicated that a 17 F design temperature would be better and it would cover 99 percent of the design requirements as reported by Dr. Paul Siple. Mr. Stacheleck indicated that there are two problems concerning insulation, one being heat, and the other condensation. He defined and described vapor barriers and added that they were necessary to prevent condensation. Summer design conditions were stated as being 92 to 95 F dry bulb and 78 F wet bulb. This would give a maximum dew-point design temperature of about 75 F and anything below 75 F should be insulated and include a vapor barrier. Mr. Stacheleck added that vapor barriers should be carefully selected and that for temperatures varying from 75 to 50 F, those with a rating of 1.0 permeance are considered satisfactory, from 50 to 32 F, 0.5 permeance is necessary, and below 32 F, a rating of as near 0.0 as possible should be used. He stated that when insulation is used inside of a duct, the sheet metal serves as a vapor barrier, while insulation on the outside requires a vapor barrier of another material.

G. O. Hartzel, also of Owens-Corning, then spoke briefly on application of insulating materials for low temperature installations. Attendance 48. Attendance ratio 0.47.

• *CENTRAL OHIO*—April 21, 1952. Following dinner in the Grandview Inn, the meeting was called to order at 8:00 p.m. The nominating committee submitted its report on nominees for officers for 1952-53. The committee's recommendations were unanimously approved and the following officers were elected: *President* — A. D. Bogen; *Vice President* — N. T. Hess; *Secretary* — J. A. Guy; and *Treasurer* — R. A. Wilson.

The election of officers was followed by the presentation of an interesting motion picture, entitled *Design and Application of Exhaust Hoods*, which brought forth some interesting discussion on that subject. Attendance 22.

• *CINCINNATI*—May 20, 1952. This was to have been the Chapter's Annual Spring Picnic but due to an all-day rain, a dinner and election meeting was held at the Clovernook Country Club. A group of the Miami Valley Chapter members were in attendance, among other guests.

I. G. Edwards, Reaver Culbertson, and H. W. Moore were appointed tellers of election. K. M. Reik, in presenting the auditor's report, announced that the books were in order. The results of the election of officers were announced as follows: *President* — H. E. Russell; *Vice President* — R. C. Beineke; *Secretary* — F. W. Wilson; *Treasurer* — A. H. Gerdsen; *Board of Governors* — R. G. Anderson. Incoming President Russell presented a past president's pin to retiring Pres. J. J. Bechtol.

Since this was the 20th Anniversary of the chartering of the Cincinnati Chapter, those charter members who were present were asked to stand and be recognized, and G. B. Houliston presented the Chapter charter, which had been in his custody for a number of years. Attendance 87. Attendance ratio 0.47.

• *CONNECTICUT*—May 21, 1952. The meeting was called to order in the Three Cups Inn, Meriden, by Pres. T. L. Arnold. President Arnold then announced the appointment of the following committees: *Membership* — C. J. Wahnquist, Jr., *chairman*, R. W. Briggs, R. J. Pinto, P. J. Lamoureux; *Finance* — R. W. Sidbury *chairman; Meetings* — E. J. Hoagland, *chairman*, C. W. Freeman, W. A. Johnson, J. O. Ostberg; *Enforcement* — J. D. Pierce, *chairman*, G. F. Murray; *Connecticut Technical Council* — A. J. Lawless, D. M. Hummel. He also announced the appointment of A. J. Lawless as the member on the Chapters Conference Committee and T. L. Arnold as the alternate. Mr. Wahnquist reported that three new members had joined the Chapter, J. E. Grant, A. T. Carson and W. L. Peters. Mr. Hoagland reported that the next meeting would be held at the Waterbury Country Club on June 26 and would be a golf meet. Mr. Hoagland announced that the Chapter would hold 8 meetings during the next season, September through June, and one meeting would be an inspection tour. Five of the meetings would be held in Meriden, with one meeting held in Bridgeport, one in New Haven, and one in Hartford.

President Arnold announced the decision of the board of governors at its last meeting to sponsor student

members. He then presented a copy of THE GUIDE to R. B. Rosseau of the University of Connecticut, to Bernice Elliott and to Peter Peck, both of Yale University.

W. A. Johnson, president of Johnson-Goodyer, Inc., New Haven, presented a color film on *Air Distribution*. Attendance 79.

• *GOLDEN GATE*—May 1, 1952. Following dinner, Pres. T. J. Janes called the meeting to order at 7:50 p.m. in the Engineers Club. After some discussion, it was voted that a sum of $400 be appropriated from the Chapter's treasury for the purpose of sending a delegate to the Semi-Annual Meeting in Spring Lake, N. J., in order to extend the Chapter's invitation to hold the 61st Annual Meeting and Exposition in San Francisco in 1955. Eric Roberts, acting secretary, read the minutes of the regular April monthly meeting together with the minutes of the special luncheon meeting on April 11; both were approved as read. President Janes announced that the Air Pollution Symposium, conducted under the auspices of the Stanford Research Institute, was to be held on May 5 and 6 in the Huntington Hotel, Pasadena. The report of the nominating committee was presented and it was voted that the nominations be closed.

S. Rosenzweig, president of Korfund Co., Inc., spoke on the subject, *Vibration Control in Air Conditioning and Allied Fields*. In speaking on his subject, Mr. Rosenzweig stressed that vibration control is just as important as heating to human comfort, and stated that it adds longer life to equipment, and that vibration is energy not used. The talk was supplemented with slides showing applications of vibration control equipment to a wide variety of installations of different types of equipment, both heavy and light.

• *GOLDEN GATE*—April 3, 1952. Pres. T. J. Janes called the meeting to order at 7:50 p.m. in the Engineers' Club following dinner, during which the guests of the evening were introduced. It was announced that a special luncheon in honor of Society Pres. Ernest Szekely would be held on April 14. The following nominating committee was then appointed: G. M. Simonson, chairman, H. L. Duncan, and R. C. Cushing.

F. H. Green, AiResearch Mfg. Co., Los Angeles, spoke on *Survival at High Altitudes*. Mr. Green discussed the physiological and psychological problems that have been encountered in designing air conditioning units for commercial planes travelling up to 25,000 ft and for military aircraft that go up as high as 45,000 ft. He then foretold some of the difficulties that will be faced when aircraft are designed for operation in outer space. By means of cutaway models of air expansion refrigeration equipment for both jet fighters and Constellation transports, he explained the equipment that is currently used for air conditioning aircraft. A particularly interesting fact brought out in Mr. Green's talk was that the turbine motor in the jet plane cooling unit operates at a rotative speed of 110,000 rpm and produces one ton of refrigeration from a unit approximately the size of a portable typewriter. Attendance 49.

• *ILLINOIS*—May 12, 1952. The meeting was in the form of a dinner-dance in honor of President and Mrs. Ernest Szekely in the Lake Shore Club, Chicago. Members of the receiving committee and their wives welcomed the guests arriving for the social hour which was followed by dinner served at 7:30 p.m. The election of the following officers for the 1952-53 season was announced: *President* — M. W. Bishop; *Vice President* — H. G. Chapin; *Secretary* — G. V. Zintel; *Treasurer* — G. G. Freyder. The gavel was then presented to Mr. Bishop, who in turn, presented a past president's pin to G. W. Bornquist, retiring president.

President Szekely, who in addition to being president of the Society is also president of Bayley Blower Co., Milwaukee, Wis., was introduced. He gave a short talk on engineers as professional men, stressing that aside from monetary reward the engineering profession offers a sense of satisfaction in service to the public.

The meeting was then adjourned and the dancing was begun with professional entertainment provided during the intermissions. Attendance 153. Attendance ratio 0.22.

• *INDIANA*—April 25, 1952. Pres. F. C. Barton called the meeting to order in the Warren Hotel, Indianapolis, Ind., and J. T. Hardin, membership chairman, introduced the new members present, G. V. Patterson and F. E. Phelps. President Barton announced the appointment of the following auditing committee: J. A. Nyland, *chairman*, P. R. Jordan and W. R. Fenstermaker. The nominees recommended by the nominating committee for officers for 1952-53 were announced. R. G. James announced that the next meeting would be held on May 27 and that I. W. Cotton, chairman of the Society's Committee on Research, would be the speaker.

Ferdinand Jehle, secretary of the *Indiana State Board of Registration for Professional Engineers and Land Surveyors*, Indianapolis, Ind., spoke on *Are We Engineers Necessary?* Mr. Jehle spoke on the engineering profession in general and explained why professional engineers are registered to protect the public. The Indiana Registration Act for Professional Engineers and Land Surveyors was also discussed. Attendance 29.

• *IOWA*—May 13, 1952. Pres. C. H. McGuiness called the meeting to order at 8:00 p.m. in the Standard Club, Des Moines, and a letter from the president of the New York Chapter inviting the Iowa Chapter members to attend the Semi-Annual Meeting in Spring Lake, N. J., was read. The minutes of the April meeting were read and approved and the guests were introduced. President McGuiness read a letter from The Good Fellowship Club inviting the Iowa Chapter members to join. He then explained its functions, adding that it is a new Des Moines organization and that many local contrac-

tors were among the club's membership.

The following officers were elected for the 1952-53 season: *President* — R. H. Schnell; *Vice President* — J. F. Sandfort; *Secretary-Treasurer* — Bowen Campbell; *Board of Governors* — D. E. Schroeder and F. L. Pulley. President McGuiness turned the meeting over to the new president, Mr. Schnell, and D. C. Murphy presented a past president's pin to Mr. McGuiness in appreciation of his services for the past year. President Schnell, as his first official act, appointed a by-laws committee, consisting of: C. H. McGuiness, *chairman*, D. E. Wells, and D. C. Murphy.

The speaker of the evening was Scotty Swanson of Minneapolis-Honeywell Regulator Co., who spoke on *Electronic Combustion Safety Controls for Oil and Gas Burning Equipment*. Mr. Swanson described in detail the two basic systems of electronic flame control, one operating on the principle of flame conductivity and the other on the principle of flame rectification.

• *KANSAS*—May 6, 1952. The meeting was called to order at 8:15 p.m. by Pres. R. F. Bauer, following a social hour and dinner, and the minutes of the previous meeting were read and approved. The following officers were elected for 1952-53: *President* — O. P. Bullock; *Vice President* — R. L. Pennington; *Secretary* — H. D. Speyer; *Treasurer* — B. C. Brown. President Bauer read the invitation from the president of the New York Chapter to attend the Semi-Annual Meeting in Spring Lake, N. J. President Bauer thanked the members for their cooperation during the past year on behalf of the retiring officers. The meeting was then turned over to President Bullock.

R. D. Tutt, chief engineer, Tuttle & Bailey, Inc., New Britain, Conn., spoke on *High Velocity Air Handling*. Attendance 21. Attendance ratio 0.20.

• *KANSAS*—April 1, 1952. Members and guests met for a social hour and dinner, preceding the business meeting, which was called to order by Pres. R. F. Bauer at 8:00 p.m. The minutes of the previous meeting were read and approved. President Bauer then read the Chapter's tentative by-laws, which had been submitted to the Society for approval. It was pointed out that the by-laws had not yet been approved but would serve as a guide until approval is received. President Bauer appointed the following nominating committee: J. W. Kice, *chairman*, G. E. Mills, Charles Yoe, G. R. Folds, Jr., and G. N. Purcell.

O. P. Bullock, program chairman, introduced the speaker of the evening, Prof. Linn Helander, head, Department of Mechanical Engineering, Kansas State College, Manhattan, Kans. Professor Helander spoke on *Downward Projection of Heated Air*. Slides were also shown illustrating the curve of flow of the heated air at different temperatures with different velocities through various sized nozzles. Following the talk, a film was shown of the equipment set-up and laboratories that were used in compiling these data. Attendance 21. Attendance ratio 0.18.

• *KANSAS CITY*—May 5, 1952. Pres. C. W. Schumacher called the meeting to order in the Wishbone Restaurant, and the minutes of the April meeting were read and approved. The treasurer's report was presented and C. D. Jones reported on the write-up of the meeting in the Kansas City Star. Members and guests introduced themselves and D. M. Allen presented a Life Membership Certificate to H. H. Wright.

The following officers were elected for the coming season: *President* — W. A. Reichow; *Vice President* — G. H. Stoffer; *Secretary* — J. G. Barnes, Jr.; *Treasurer* — F. K. Ladewig; *Board of Governors* — C. W. Schumacher, F. J. Schaad, A. S. Hurt, Jr., and C. D. Jones. The meeting was turned over to Pres. W. A. Reichow, who presented the retiring president, C. W. Schumacher, with a past president's pin.

R. D. Tutt, chief engineer, Tuttle & Bailey, Inc., New Britain, Conn., was the speaker of the evening. Mr. Tutt discussed the basic fundamentals of the performance of grilles, ceiling diffusers, slots, etc. The last part of the talk was devoted to high pressure air distribution systems. Attendance 76. Attendance ratio 0.33.

• *MANITOBA*—April 17, 1952. Vice Pres. W. J. Atkinson called the meeting to order in the absence of Pres. J. F. Bertram. The following officers were elected: *President* — W. J. Atkinson; *Vice President* — A. K. Piercy; *Secretary-Treasurer* — Ernest Lambert; *Board of Governors* — J. F. Bertram, J. A. Bell, Gordon Christie, J. C. Stangl, P. L. Charles, D. B. Brace, and C. M. Fleming. Vice President Atkinson made a brief announcement concerning the coming golf meet.

The speaker of the evening, A. H. Watson, was introduced by Mr. Fleming. Mr. Watson gave a resumé of the events leading up to the power referendum which was recently held in Manitoba. A lively discussion period followed the talk. Attendance 18.

• *MEMPHIS*—April 21, 1952. The meeting was called to order by Pres. R. E. Larkin in the King Cotton Hotel, following dinner, which was served at 6:30 p.m. The minutes of the previous meeting were read and approved as read. President Larkin introduced and welcomed the guests, and A. T. Bevil, the secretary, read a letter of congratulations to the Arkansas Chapter on its organization.

G. C. Burr, chairman of the meetings committee, introduced the choral group from Christian Brothers College under the direction of Brother Ernest. The group, consisting of 12 seniors, gave a number of musical renditions that were thoroughly enjoyed by the membership.

The following officers were elected for the year 1952-53: *President* — W. L. Drake; *Vice President* — M. H. Ellis, Jr.; *Secretary* — A. T. Bevil; *Treasurer* — J. W. McIntosh. President Larkin thanked the officers and members for their cooperation throughout the year and then turned the office of president over to Mr.

Drake, the incoming president. Attendance 39.

• *MICHIGAN*—April 4, 1952. This meeting combined Ladies' Night and Past Presidents' Night and according to the report of the secretary, the affair was so successful that it promises to be an annual event. Fifteen past presidents, most of them accompanied by their wives, attended the meeting, including the Chapter's oldest living past president, E. M. Harrigan. Mr. Harrigan, who served during 1923-24, made a few remarks, both entertaining and serious, and then he presented a past president's pin to C. F. Donohoe, Chapter president during 1950-51.

Brig.-General S. L. A. Marshall, military editorial analyst for the Detroit News, gave an address entitled *The Meaning of Korea.* General Marshall spent several months on active duty with the U.S. Army in Korea last year and therefore spoke from first-hand personal observation. The talk was thoroughly enjoyed by the entire group. Attendance 93.

• *MINNESOTA*—May 21, 1952. The meeting was called to order by Pres. E. F. Snyder in the Robin Hood Room of the Dyckman Hotel. The minutes of the April meeting were read and approved and the guests were introduced. J. L. Hanson, of the social committee, announced that the Spring Party was scheduled for June 20 and would feature golf and a dinner at the Golden Valley Country Club.

J. E. Haines introduced Ernest Szekely, president of the Society and president, Bayley Blower Co., Milwaukee, Wis., who traced the development and growth of the Society from 1895, with a membership total of 45, to the present day size of 8500 members. He stated that the Society is unique in that it maintains its own research laboratory and is confined to a specialized field.

All of the living past presidents of the Chapter had been invited to the meeting, and a total of 18 were present. William Sturm presented pen desk sets to O. L. Lilja, R. C. Jordan, G. M. Kendrick, and E. F. Snyder, Jr., this year's retiring president, in remembrance of their terms as Chapter presidents. The retiring president turned the meeting over to Pres. William Sturm, the incoming president, who in turn introduced the other officers.

E. F. Snyder, Jr., heating engineer, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., spoke on *The Control of Panel Heating.* Attendance 110.

• *MINNESOTA*—April 7, 1952. Pres. E. F. Snyder called the meeting to order in the Robin Hood Room of the Dyckman Hotel, and the minutes of the March meeting were read and approved. It was unanimously agreed that the Chapter invite all living past presidents to the May meeting as guests. President Snyder announced that chapters had been chartered at Little Rock, Ark., and Vancouver, B.C., Canada, and V. E. Pearson presented the treasurer's report.

The results of the election of officers for 1952-53 were as follows: *President* — William Sturm; *Vice President* — V. E. Pearson; *Secretary* — J. G. Hamm; *Treasurer* — J. A. Craig; *Board of Governors* — L. J. Krause and B. F. McLouth.

D. F. Bennett, manager, Warren Webster & Co., Camden, N. J., spoke on *Baseboard Heating.* Attendance 149. Attendance ratio 0.45.

• *MONTREAL*—May 19, 1952. The meeting was called to order in the Berkeley Hotel by Pres. W. G. Hole, and the minutes of the April meeting were read and approved. President Hole introduced J. H. Ross and H. R. Roth, president and secretary, respectively, of the Toronto Chapter as honored guests at the meeting. T. E. Cockman announced the final arrangements for the Spring Golf Tournament scheduled for June 18 at Lachute Golf and Country Club. President Hole announced with regret that R. R. Noyes, past president of the Chapter, had notified the Chapter that he is being transferred to Windsor, Ontario, but wishes to retain out-of-town membership in the Montreal Chapter.

The members were then taken on a tour of the new Canadian Broadcasting Corporation in Montreal. G. B. Elliot, mechanical engineer for the corporation and J. E. Hayes, assistant to the director general of engineering in charge of television, conducted the members through the studios where the operating personnel explained the air conditioning installations and the operation of the equipment. Attendance 84. Attendance ratio 0.44.

• *MONTREAL*—April 22, 1952. Pres. J. G. Chenevert called the meeting to order at 6:45 p.m. following dinner in the Berkeley Hotel. The minutes of the March meeting were read and approved. President Chenevert addressed the Chapter, since this was the last meeting of the season, and incoming Pres. W. G. Hole presented him with his past president's pin and memorial gavel. President Hole expressed his appreciation for being elected president and presented the slate of committees he had appointed. The committees follow: *Program*—Ivan McDonald, R. R. Noyes, S. R. Plamondon; *Entertainment*—W. E. Jarvis, H. G. S. Murray; *By-laws*—J. D. Ross, G. L. Wiggs; *Attendance and Arrangements*—R. R. Duquette, J. L. Knight, Arthur de Breyne; *Research*—D. L. Lindsay, T. G. Anglin, Henri Dagenais, Hector Asselin; *Membership*—J. C. Hennesey, Robert Clapperton; *Publicity*—Leo Garneau, Henri Dagenais; *Code*—L. C. A. Walford, R. R. Duquette, Yvon-Roma Tasse; *Chapter Relations*—J. G. Chenevert, R. R. Noyes; *Finance*—Robert Kerr; *Auditor*—F. G. Phipps.

G. Lorne Wiggs, partner, Wiggs, Walford, Frost & Lindsay, Montreal, spoke on *The New National Building Code of Canada.* Mr. Wiggs, who is chairman of the committee preparing the section on building services, covered in detail the work involved in the preparation of the new code. J. P. Fitzsimons and Mr. Noyes, who are members of the committee on heating and ventilating, assisted Mr. Wiggs by describing the functions of their committee. Attendance 62. Attendance ratio 0.37.

• *NEBRASKA*—May 6, 1952. Following a social hour and dinner, the meeting was called to order in the Persian Room of the Cornhusker Hotel, Lincoln, Nebr., by Pres. K. E. Martin. This was the annual *Lincoln Meeting*, and President Martin extended the Chapter's appreciation to M. G. Lehman for making the meeting both possible and successful. G. W. Colburn, past president and chairman of the nominating committee, presented the committee's recommendations for officers for 1952-53.

Following the short business session, Ernest Szekely, president of the Society and president of Bayley Blower Co., Milwaukee, Wis., was introduced as the guest of the evening. President Szekely spoke briefly on his subject, *Pneumatic Conveyors*, and he then proceeded to outline the Society's development from its small beginning through to its present size of approximately 8500 members. Following adjournment, many remained for further discussion. Attendance 53.

• *NORTH TEXAS*—May 19, 1952. Pres. R. E. Allison called the meeting to order in the Melrose Hotel. Members introduced themselves and their guests, and the minutes of the April meeting were read and approved. It was voted that the Chapter continue the policy of keeping individual attendance record cards and also that these records be considered by the nominating committee when selecting nominees for officers. W. E. Frost, chairman of the program committee, reported on the coming June social meeting to be held at Stockman's Cafe at Fair Park.

G. F. Landgraf, vice president in charge of engineering, Trion, Inc., McKees Rocks, Pa., spoke on *Electrostatic Precipitation*. Mr. Landgraf briefly outlined the development of electrostatic precipitation and stated that this process was not applied to filtration systems to any great extent until the design permitted the desired results to be obtained without the production of excessive amounts of ozone. He also described the relative performance of mechanical and electrostatic filters and emphasized the need for each in its respective field. Mr. Landgraf also covered the problems involved in the standardization of filter testing techniques. The performance of an electrostatic filter was then demonstrated through the use of a small working model. Attendance 70. Attendance ratio 0.37.

• *NORTHERN OHIO*—April 14, 1952. Pres. John Richmond called the meeting to order at 8:30 p.m. in the Warner Auditorium of the Cleveland Engineering Societies Building. Preceding the regular business meeting, C. M. Humphreys, senior engineer at the Research Laboratory, reviewed the projects being carried out at the Laboratory and cooperating institutions. The minutes of the March meeting were read and approved, and an announcement was made to the effect that the Spring Golf Party would be held at Acacia on May 20. A nominating committee was selected as follows: W. M. Rowe, R. L. Byers, and J. E. Wilhelm, and the committee was instructed to prepare a list of six men, three of whom would be chosen to serve as the standing nominating committee, in addition to preparing a slate of nominees for new officers.

W. S. Harris, special research associate professor, University of Illinois, Urbana, Ill., spoke on *Low Cost Piping for Hot Water Heating Systems*. In a few preliminary remarks, Professor Harris stated that most of the research at the University of Illinois is sponsored by industry and that the research that he is doing on hot water systems is being sponsored by the *Institute of Boiler and Radiator Manufacturers*. He advised that research on steam and hot water heating was begun at the University in 1935 and showed by means of slides views of the I=B=R house, and the instrumentation and the piping that are being used in the current project. He gave an analysis of the cost of three types of piping arrangements, the conventional one-pipe, the simplified one-pipe and the series system. In his cost analysis he based his comparison on the simplified piping arrangement using a circulator rather than upon a gravity system. The analyses did not include the cost of radiator valves since Professor Harris was of the opinion that they are not necessary. Professor Harris presented a detailed cost analysis of all three systems and explained that the conventional one-pipe and the series systems actually were installed in the I=B=R house while the cost data for the simplified one-pipe system were estimated. He mentioned that the savings realized in the series system as compared to the conventional type were less in two-story homes than in one-story homes due to the increase in the vertical piping necessary. Attendance 33.

• *NORTHERN PIEDMONT*—May 2, 1952. L. L. Vaughan, Raleigh, N.C., called the meeting of the Northern Piedmont Chapter to order at 8:00 p.m., following a social hour and dinner at Bliss Restaurant, Greensboro, N.C.

Professor Vaughan read a communication from A. V. Hutchinson, executive secretary of the Society, regarding the division of the North Carolina Chapter. The new charter of the Northern Piedmont Chapter was presented, and on motion of C. Z. Adams, duly seconded, it was voted that a record of the charter memberships for the Northern Piedmont Chapter be recorded in the minutes.

Professor Vaughan stated that division of the funds had been made on the basis of 50 percent to each new chapter of the balance at the end of the fiscal year, and that all dues collected since the beginning of the fiscal year were turned over to the individual member's chapter.

Motion was made and passed that the election of officers take place, and the following officers were nominated and duly elected: *President*—L. L. Vaughan; *Vice President*—J. E. Hart; *Secretary-Treasurer*—J. W. Bunn, Jr.; *Board of Governors*—W. D. Graham, Jr., Arvin Page, and F. J. Reid.

A motion was made and carried that there be no boundary limitations put into the by-laws. After announce-

ment that a joint summer meeting with the Southern Piedmont Chapter would be held June 21-22, the meeting adjourned. Attendance 22.

• *ONTARIO*—May 15, 1952. The meeting was called to order by Pres. William Philip in the Royal York Hotel. President Philip called for the presentation of annual committee reports and the following members made reports for the committees indicated; C. J. Bootes—*Papers;* C. D. Waldon—*Attendance;* F. D. Ledgett—*Membership;* W. J. Wilkinson—*Fellowship;* Charles Torry—*Greeters* and *Auditing;* N. W. Kingsland—*Publicity;* F. W. Chambers—*Research.* It was voted that a yearly $50 award be established for the student writing the best thesis on heating, ventilating, and air conditioning from Queens University similar to the one already established for the University of Toronto.

The following officers were elected for 1952-53: *President*—J. H. Ross; *Vice President*—N. W. Kingsland; *Secretary-Treasurer*—H. R. Roth; *Board of Governors*—D. L. Angus, M. C. Bailey, C. J. Bootes, and William Philip. Incoming President Ross presented a past president's pin to retiring President Philip and also a certificate from the board of governors for his service during 1951-52.

J. R. Vernon, vice president and sales promotion manager, Johnson Service Co., Milwaukee, Wis., spoke on *Commercial Relations to Build Business.* Attendance 112. Attendance ratio 0.42.

• *OREGON*—May 8, 1952. Pres. K. H. Hanson called the meeting to order at 7:40 p.m. in the Old Heathman Hotel. The minutes of the March and April meetings were read and approved. The guests of the evening were then introduced.

A. N. Hoss introduced the speaker of the evening, Col. E. C. Itschener, commander, North Pacific Division of the U.S. Army Engineers. Colonel Itschener gave an interesting talk on the work of the engineers in Korea both in construction and demolition work.

It was voted that the social committee make arrangements for a picnic to be held August 15 at Bonnie Lure Park on the Clackamas. After considerable discussion it was agreed that the Oregon Chapter would sponsor the 8th Air Conditioning Conference to be held in the Spring of 1953 at Portland, Ore. It was further agreed that a petition be sent to Council asking permission to hold an exposition simultaneously with the conference. Attendance 56.

• *PACIFIC NORTHWEST*—May 13, 1952. Pres. R. M. Stern called the meeting to order at 7:15 p.m. in the College Club. A discussion on what kind of an affair to hold for Ladies Night led to the decision to hold a dinner-dance at the White Center Lions Club. T. C. Caskey gave the treasurer's report, and President Stern appointed a committee to select a meeting place for the next season.

The following officers were elected for the next season: *President*—W. B. Pride; *First Vice President*—H. T. Orebaugh; *Second Vice President*—T. C. Caskey; *Secretary*—I. L. Winsor; *Board of Governors*—M. W. McKinstry and R. C. Lewis. After the officers were sworn in, the gavel was presented to incoming President Pride.

Col. Valentine Gephart spoke on corrosion in hot water and steam heating systems and the various methods of controlling corrosion. Attendance 47.

• *PACIFIC NORTHWEST*—April 8, 1952. The meeting was held at the Puget Sound Naval Shipyard in Bremerton and members met at 3:30 p.m. and boarded the ferry for Bremerton. The members were met at the shipyard by C. B. Dominy, Chapter member who is a mechanical engineer at the shipyard, and taken on a tour through the heavy cruiser, Quincy. Following the tour, members enjoyed a social hour and dinner in the Officers Club.

Pres. R. M. Stern called the meeting to order at 8:30 p.m. and turned it over to M. C. McLennan, also a Chapter member, and supervisor of heating and ventilating design, Puget Sound Naval Shipyard. Mr. McLennan introduced the guests from the shipyard as follows: Captain H. J. Pfingstag, United States Navy, planning officer; Commander D. A. Ball, United States Navy, design superintendent; R. E. Johnson, head engineer and A. Oass, deputy head engineer.

Captain Pfingstag spoke on the reconversion job just completed on the Carrier Kearsarge, highlighting some of the items in the 43 million dollar reconversion job. He stated that the ventilating system comprises 13½ miles of ductwork, using 370 fans of various sizes which circulate 1,000,000 cfm of air. He added that there are 250 heating units having a capacity of 17,000,000 Btu per hr or enough to heat a 17-story building. The time required for the entire conversion job was two years.

Commander Ball spoke on the rapid strides made in air conditioning for naval vessels and recalled that as late as 1943 mechanical cooling was not acceptable in naval vessels. He stated that air conditioning is now installed in many sections of ships including berthing and control spaces and planning spaces.

H. O. DeBolt gave an illustrated lecture on *Shipboard Air Conditioning* and Leo Classen gave an illustrated lecture on *Air Conditioning with Chilled Water.*

President Stern then introduced Ernest Szekely, president of the Society and president, Bayley Blower Co., Milwaukee, Wis., who was the honored guest of the evening. President Szekely spoke on *The ASHVE and Progress in Comfort.* Attendance 81.

• *PITTSBURGH*—May 19, 1952. Dinner was served to 68 members and guests of the Pittsburgh Chapter at Webster Hall. Following the reading of the April minutes, which were approved as read, Pres. W. D. Simpson announced the dates of the Society's Semi-Annual Meeting in Spring Lake, N. J., June 16-18, and reminded the members of the golf

date with the *ASRE* members at the Chartiers Country Club on June 10.

E. H. Riesmeyer, Jr., secretary, submitted the report of the nominations for officers and a unanimous vote was cast which resulted in the election of the following: *President*—B. B. Reilly; *Vice President*—C. H. Schneider; *Secretary*—E. H. Riesmeyer, Jr.; *Treasurer*—C. L. Benn; *Board of Governors*: E. C. Hach and G. M. Comstock.

After a few words of appreciation for the assistance given him during the past year, retiring President Simpson then turned the gavel over to the incoming president, Mr. Reilly, who in turn, presented Mr. Simpson with the past president's pin. Movies were shown, followed by adjournment. Attendance 68.

• *ROCKY MOUNTAIN*—May 7, 1952. Pres. B. H. Spurlock, Jr., called the meeting to order at 8:00 p.m. in the Albany Hotel. The guests were introduced and President Spurlock suggested that the members adjourn to a private room to handle the business part of the meeting. Actually all business was dispensed with aside from the election of new officers. The officers elected for 1952-53 were announced as follows: *President*—N. H. Brickham; *Vice President*—H. L. Wray; *Secretary*—A. S. Widdowfield; *Treasurer*—L. L. DeLong; *Board of Governors*—H. J. Woehlke and E. J. McEahern.

Ernest Szekely, president of the Society, and president, Bayley Blower Co., Milwaukee, Wis., was introduced, and proceeded to conduct the installation of the new officers. President Szekely then spoke briefly on the Society's aims and activities and gave some interesting facts concerning the Society's organization. Attendance 65.

• *ROCKY MOUNTAIN*—April 2, 1952. The feature of the evening was an address by Roy Gordon of the Gas Engineering Department, Public Service Co., on *Gas Burning Equipment*. Mr. Gordon stated that the *American Gas Association* had conducted exhaustive tests on all different gas appliances in Cleveland. The appliances without adjustment were also sent to Denver for testing. No great changes in rating were found necessary for Denver.

Mr. Gordon stressed the importance of burner installation, stating that regardless of how fine the burner is, if it is improperly installed it will not work efficiently. He also stated that the addition of some type of draft control for atmospheric type burners is an important factor, adding that the limit of efficiency on this type burner was 95 percent. On the other hand the efficiency on a power-type burner is slightly greater and in adjusting this burner an orsat apparatus should always be used. The talk was followed by a question and answer period. Attendance 34.

• *SHREVEPORT*—May 15, 1952. A talk on *Selection of Systems for Heating* by L. L. Landauer, consulting engineers, Landauer & Guerrero, Dallas, Tex., was the feature of the evening. Mr. Landauer limited his discussion to residences, small commercial buildings, schools, and medium size office buildings. The types of systems covered in the talk included gas fired space heating, forced warm air, two pipe steam or hot water systems, radiant panel systems, unit heaters, unit ventilators, and one pipe steam and hot water systems. The relative merits of each type of system as to initial cost, operating and maintenance costs and effectiveness were reviewed along with the disadvantages. It was pointed out that direct-fired space heating was lowest in initial cost but high in operating and maintenance cost and the least effective system. Forced warm-air systems are possibly the most popular in this part of the country and it was emphasized that it is impossible to effectively give year-around air conditioning with the forced warm-air systems unless a split duct system, booster coils and expensive controls are used, which run up the initial cost. In Mr. Landauer's opinion it is physically impossible to size ducts and outlets to give effective heating on the north side of the building and still give effective cooling on the east or the west side, without resorting to dampers, split ducts and/or booster coils.

He stated that the two-pipe steam or hot water system is very effective with standing radiators, convectors or baseboard heating; however, some form of ventilation should be provided. For residences, churches, industrial plants and similar installations, Mr. Landauer stated that he regarded radiant panel heating as the most effective. He added that here again some means of ventilation should be provided and expressed a preference for copper tubing for ceiling or wall panels with welded steel or wrought iron pipe in floor panels, preferably floor panels with the coils laid on top of the structural slab and not in it. Steam or hot water unit heaters are very effective for industrial installations and similar installations having high ceilings and where a low noise level is not necessary. Mr. Landauer preferred unit ventilator types of systems in school installations and one pipe steam or hot water systems where long pipe runs are not involved.

The meeting was called to order by Pres. R. M. Hood in the Colonial Room of the Caddo Hotel. Attendance 28. Attendance ratio 0.47.

• *SOUTH TEXAS*—May 16, 1952. The meeting was held at the Alabama Catering Service, Houston, and was called to order by Pres. R. J. Salinger. President Salinger read the audit report prepared by the committee with H. O. Williams as chairman and announced that there was a comfortable balance.

Norman Brown, chairman of the publicity committee, advised briefly about the publicity the Chapter received during the past year and recommended that an effort be made to appoint a chairman for the coming year who has a closer relationship with newspaper reporters.

W. L. Lashley, Jr., gave a brief report on the progress of the membership committee, followed by a report submitted by the treasurer, which was approved as read. C. L. Fleming expressed his appreciation for the help given him as chairman

of the program committee during the past year.

President Salinger then introduced F. B. Frazee, chairman of the legislative committee of the Southwest Texas Chapter, who spoke briefly about the by-laws regarding air conditioning in State buildings and more specifically with regard to a detailed definition of the term *air conditioning*. In this connection he read a resolution to be sent to the House of Representatives at their next meeting asking for a revision in the statute to define air conditioning accurately. It was moved by O. G. Rivoire, seconded by A. F. Barnes, and voted unanimously that the South Texas Chapter adopt the resolution and that the secretary notify Mr. Frazee of the agreement.

President Salinger reported on the progress of the City Code and indicated that it was possible that the Code be railroaded through the City Council before having an opportunity to revise the chapters which pertain to the air conditioning industry. Sidney Bromberg moved that the South Texas Chapter send a resolution to the City Council to hold out the two chapters until there has been sufficient time to properly edit them, and this motion was seconded by Mr. Holland, and passed unanimously.

President Salinger then thanked the officers, board of governors and committee chairmen for all the help they had given him during his term of office, and then read the report of the nominating committee. He announced the results of the election by acclamation as follows: *President*—C. L. Fleming; *Vice President*—E. G. Floeter, Jr.; *Secretary*—J. Wayne Holland; *Treasurer*—F. M. Neil; *Board of Governors*—J. C. Lewis and I. A. Naman.

The retiring president then presented President Fleming with the gavel and turned the remainder of the program over to him. Incoming President Fleming thanked Mr. Salinger for the fine service rendered in taking over the presidency at the beginning of the year and presented to him, on behalf of the membership, a diamond to be placed on his past president's pin.

Mr. Fleming introduced W. J. Way, II, who in turn introduced the speaker of the evening, G. L. Simpson, vice president and general manager, Pittsburgh Lectrodryer Corp., Pittsburgh, Pa., and chairman of the Society's Research TAC on Sorption, whose talk was entitled *The Ocean of Air*. Mr. Simpson's talk was based on a series of lectures given at the Buhl Foundation, and gave the members an entertaining and instructive hour or so with the great *Ocean of Air* in which man lives. The subject was of real practical interest to air conditioning engineers today for stratospheric flying and research with rockets and guided missiles require testing practically all of the components of these machines in test chambers at temperatures, pressures and humidities simulating the outer reaches of our atmosphere. After an interesting discussion, the meeting adjourned at 9:45 p.m. Attendance 77. Attendance ratio 0.38.

• *SOUTH TEXAS*—April 18, 1952. Members and guests met for a social hour and dinner at the Alabama Catering Service, after which the business meeting was called to order by Pres. R. J. Salinger at 8:00 p.m. G. W. Brown, Jr., vice president and sales manager, Southern Furnace and Supply Co., Houston, and J. A. Olson of Way Engineering Co., Houston, gave brief biographical sketches. The minutes of the previous meeting and the treasurer's report were read and approved. President Salinger advised that he had appointed the following nominating committee: H. W. Broadwell, *chairman;* C. C. Quin, D. M. Mills, B. P. Fisher, and A. F. Barnes. The following auditing committee has also been appointed: H. O. Williams, *chairman;* Joe Lee and R. O. Ayres, Jr. Mr. Mills advised that the invitation to the Society to hold the Annual Meeting in 1954 in Houston had been approved by the Council.

Mr. Fisher introduced Dr. C. A. Nau and Dr. F. B. Engley, Jr., both of the University of Texas Medical School in Galveston. Dr. Engley presented a paper on *Opportunities in Hospital Air Conditioning*, which was illustrated with slides. Attendance 61.

• *UTAH*—April 17, 1952. Members and guests were taken on a conducted tour of the Salt Lake Refinery after which luncheon was held in the Hot Shoppes, Salt Lake City. The evening meeting was called to order by Pres. A. R. Curtis at 8:40 p.m. The minutes of the previous meeting were read and approved. President Curtis announced the results of the election of officers as follows: *President* — D. R. Wilde; *Vice President* — M. L. Gollaher; *Secretary-Treasurer* — Alfred Richeda.

President Curtis then introduced Ernest Szekely, president of the Society and president, Bayley Blower Co., Milwaukee, Wis., who spoke on the founding and the development of the ASHVE. The meeting was adjourned at 9:10 p.m. Attendance 38.

• *WESTERN NEW YORK* — May 12, 1952. Pres. T. F. Killeen called the meeting to order at 8:10 p.m. in the University Club. Joseph Davis presented a Life Membership Certificate to C. H. Love and also to J. J. Yager in absentia, who was unable to attend.

The minutes of the April meeting were read and approved, and President Killeen appointed P. S. Hedley, V. N. Harwood, and J. B. McGee as the tellers of election. The guests of the evening were introduced and an announcement concerning the Semi-Annual Meeting in Spring Lake, N. J., was made.

Cyril Tasker, director of research, ASHVE Research Laboratory, Cleveland, Ohio, presented an interesting illustrated lecture on the work being done at the Laboratory. Following the meeting there was considerable discussion on the details of the installation of the new Environment Laboratory.

The results of the election of officers for 1952-53 were then announced as follows: *President* — J. M. Quackenbush; *First Vice President*—C. W. Stone; *Second Vice President* — R. E. Lang; *Secretary* — Q. P. Thompson; *Treasurer* — B. C. Candee; *Assistant Treasurer* — C. W. Kaupp; *Board of Governors* — T. F. Killeen, M. C. Beman, Roswell

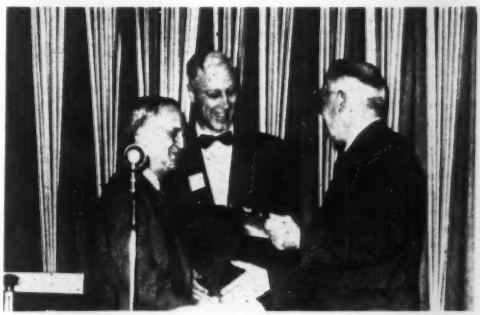
Farnham, Joseph Davis, and S. M. Quackenbush. Attendance 36.

• *WISCONSIN* — May 19, 1952. Members and guests met in the Pfister Hotel for a social hour and dinner, which was followed by the final meeting of the 1951-52 season. This meeting combined Ladies Night and the annual business meeting as well. Pres. H. F. Brinen called the meeting to order and called for the reading of all the committee reports. L. C. Plaehn announced that the Annual Outing would be held at the Tuckaway Country Club on May 27 and that an attendance of close to 100 was expected. President Brinen announced that the Gustav L. Larson Award was to be presented to Eustace Faust, Jr., a senior graduating from the University of Wisconsin, who was selected by the faculty as being the best all-round student in the field of heating, ventilating and air conditioning. The presentation is to be made at the Annual Outing.

The following officers were elected for 1952-53: *President*—J. A. Lofte; *Vice President* — N. E. Hill; *Secretary* — I. J. Rossiter; *Treasurer* — L. C. Plaehn; *Board of Governors* — B. M. Kluge, A. S. Krenz, and H. F. Brinen. Mr. Brinen turned the meeting over to incoming President Lofte and presented him with an engraved gavel with which to conduct the meetings. Mr. Kluge then presented Mr. Brinen with a past president's pin for the excellent job he had done during the year.

President Lofte introduced Ernest Szekely, president of the Society and president, Bayley Blower Co., Milwaukee, Wis., who made a few brief welcoming remarks to those present.

Prof. D. W. Nelson introduced Professor Hougen, chairman of the Chemical Engineering Department at the University of Wisconsin, Madison, Wis. Professor Hougen, who had recently spent a semester teaching chemical engineering at the Norwegian Technical Institute at Trondheim, showed slides of hundreds of pictures he had taken while in Norway of the country's agriculture, industry, and the natural geographical beauties of the country. At the end of the illustrated lecture, an enthusiastic vote of thanks was extended to Professor Hougen for a delightful evening. Attendance 65. Attendance ratio 0.21.



Harry S. Wheller, (*right*) president and general manager, L. J. Wing Mfg. Co., Linden, N. J., receiving engraved silver tray from Charles H. Smith, (*center*) secretary, and Walter W. Wilson, (*left*) vice president and treasurer, at *Open House* celebration and reception for employees and their families

H. S. WHELLER HONORED ON FIFTIETH ANNIVERSARY

A feature of the *Open House* held recently by L. J. Wing Mfg. Co., Linden, N. J., for their employees and their families, was the special service award presented to H. S. Wheller, president, after completing 50 years of service with the company. In addition to this special award, which was presented by C. H. Smith, secretary and director of the company, Mr. Wheller delivered a talk on the history of the company and its progress. Mr. Wheller was also the recipient of many gifts from employees and from the officers.

The founder of the company, L. J. Wing, was still living when Mr. Wheller joined the company in 1902, and it was under his guidance that he started his career as draftsman, designer, and later became superintendent of construction, superintendent of manufacture, sales manager, vice president and secretary in charge of fan and blower sales and engineering, and in 1943 he was elected president and general manager.

Besides Mr. Wheller, 65 other Wing employees were appropriately honored at the *Open House*, 28 of whom have completed 10 years of service, 12 have completed 15 years, 10 have completed 20 years, 11 have completed 25 years, one has completed 30 years, two have completed 35 years, and one has completed 40 years.

The 30-year man is Mr. Smith, who made the presentation to Mr. Wheller, and who was elected secretary in 1943 when Mr. Wheller became president. Among those who have served 20 years is T. R. Peyrek, also a member of ASHVE. Both Mr. Wheller and Mr. Peyrek served as members of the Ladies Committee of the Committee on Arrangements for the Semi-Annual Meeting in Spring Lake, N. J., last month.

FLEISHER HEADS ADVISORY COMMITTEE TO N.Y. SMOKE CONTROL BOARD

Announcement has just been made of the appointment of the Advisory Committee to the Smoke Control Board of New York City, with Walter L. Fleisher, president, Air & Refrigeration Corp., 475 Fifth Ave., as chairman. The other members are: W. D. Lewis, chief engineer, Hotel New Yorker, 34th St. at Eighth Ave.; Philip O'Keefe, consulting engineer, 114 Liberty St.; Frank Sutton, consulting engineer, 70 East 45th St.; P. W. Swain, editor of the magazine *Power*, McGraw-Hill Bldg., 330 West 42nd St.; and H. W. Wilds, chief engineer, New York Life Bldg.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 88 applications for membership, including 13 student applications and 3 reinstatements; in addition 9 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by July 31, 1952, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement

California

BASYE, R. L., Owner, West Sacramento Sheet Metal Products Co., West Sacramento. REFERENCES: W. C. Denner, H. J. Gaudette*, T. W. Johnston, J. E. Marshall.

BROWN, E. E., Mgr., By-Products Div., The Pacific Lumber Co., San Francisco. REFERENCES: A. J. Hess, Edward Simons, C. D. Williams, D. L. Williams.

CHINN, THOMAS, Asst. Mech. Engr., State of California, Div. of Architecture, Sacramento. REFERENCES: G. O. Fowble, J. E. Marshall, Arthur Roth, V. W. Thornburg.

CONNOLLY, F. A., Foreman, Harvey H. Holland Co., Sacramento. REFERENCES: R. M. Graham, R. R. Hefner*, H. H. Holland*, C. D. Wulff*.

GILLET, C. A., Estimator, Neil H. Peterson Co., San Francisco. REFERENCES: K. O. Alexander, H. V. Hickman, J. E. Murray, N. H. Peterson.

GRAHAM, R. M., Co-owner, Harvey H. Holland Co., Sacramento. REFERENCES: M. R. Carpenter*, J. E. Marshall, L. A. O'Meara, George Sellon*.

GRANT, J. J., Sr. Mech. Engr., State of California, Div. of Architecture, Sacramento. REFERENCES: K. O. Alexander, J. E. Marshall, L. A. O'Meara, N. H. Peterson.

HEDQUIST, J. E., Mgr., Warm Air Htg. Dept., Tay-Holbrook Inc., San Francisco. REFERENCES: C. E. Bentley, J. M. Marr, S. W. Terry, N. S. Wright, Jr.

NOLTE, F. W., Chief Engr., Travis Air Force Base, Fairfield. REFERENCES: H. V. Hickman, J. E. Marshall, E. C. McKinsey, S. A. Owen.

OWEN, S. A., Travis Air Force Base, Fairfield. REFERENCES: H. V. Hickman, E. C. McKinsey, F. W. Nolte, E. E. Phillips.

△POLVERINI, R. A., Vice Pres., Pioneer Water Heater Corp., Los Angeles. REFERENCES: R. S. Ash, Leo Hungerford, J. R. Lockwood*, E. S. Slater*.

△SHARPE, NORMAN, Head, Refrig. & Air Cond. Dept., California State Polytechnic College, San Luis Obispo. REFERENCES: A. J. Hess, L. A. O'Meara, D. D. Wile, W. L. Yerkes.

WONG, MARY C., Designer, Ralph M. Parsons Co., Los Angeles. REFERENCES: R. E. Bass, J. S. Earhart, James Gayner, J. B. Smith.

Illinois

△BORNQUIST, G. W., Pres., Bornquist, Inc., Chicago. REFERENCES: M. W. Bishop, C. M. Burnam, Jr., C. W. De Land, J. S. Kearney.

CUTLER, R. A., Draftsman, Neiler Rich & Bladen, Chicago. REFERENCES: H. G. Gragg, F. H. Markus, H. E. Olszewski, E. A. Whitelaw.

Iowa

SNYDER, W. H., Div. Mgr., Thermal Co., Inc., Des Moines. REFERENCES: C. H. McGuiness, E. H. Pietsch, R. G. Siple, F. E. Triggs.

Kansas

GUDEMAN, D. J., Engr., S. A. Long Co., Inc., Wichita. REFERENCES: R. F. Bauer, B. C. Brown, O. P. Bullock, E. G. Fahnestock.

HOWLEY, R. M., Draftsman, Office of State Architect, Topeka. REFERENCES: D. M. Allen, D. C. Hoss*, E. C. Sneegas, F. J. Stevens.

MOODY, N. D., Mech. Engr., Office of State Architect, Topeka. REFERENCES: D. M. Allen, F. K. Ladewig, C. L. Marshall*, E. C. Sneegas.

Massachusetts

MITCHELL, J. G. A., Vice Pres., C. A. Breed, Inc., West Newton. REFERENCES: D. W. Blair, John Bonner, F. A. Merrill, D. C. Miller.

Michigan

GORWOOD, C. E., Sr. Draftsman, Fred L. Pearson, Cons. Engrs., Detroit. REFERENCES: Robert Braun*, Elbert De Cenzo*, J. B. Heaton, F. L. Pearson.

Minnesota

ARNDT, W. W., Mech. Engr., Ellerbe & Co., St. Paul. REFERENCES: J. V. Borry, J. A. Rudberg, William Sturm, C. C. Wells.

CICH, C. L., Htg. Engr., Goodin Co., Minneapolis. REFERENCES: J. G. Hamm, C. T. Lawrence, L. K. Reisberg, W. K. Shine.

HOLBERG, D. L., Engr., Twin City Arsenal, New Brighton. REFERENCES: J. V. Borry, R. C. Bosworth, J. B. Gallea, J. D. Gray, Jr.

LARSEN, ARDEEL M., Sales Engr., Uhl Co., Minneapolis. REFERENCES: A. B. Algren, G. M. Orr, M. E. Quigley, E. J. Uhl.

MACY, H. A., Mechanical Draftsman, Gausman & Moore, Cons. Engrs., St. Paul. REFERENCES: C. E. Gausman, G. F. Gausman, A.P.H. Keller, William McNamara.

OLSON, C. T., Mech. Engr., Lang & Raugland, Minneapolis. REFERENCES: A. B. Algren, C. D. Elving*, V. C. Lundquist*, Henning Peterson*.

PECK, V. A., Engr., Federal Cartridge Corp., New Brighton. REFERENCES: J. V. Borry, R. C. Bosworth, J. B. Gallea, J. D. Gray, Jr.

†THOMPSON, W. G., Dist. Mgr., Duo Therm Div., Motor Wheel Corp., Wayzata. REFERENCES: V. H. Hill, J. W. Miller, L. G. Miller, C. H. Pesterfield.

Missouri

HANLON, D. E., Chief Mech. Engr., Fruin-Colnon Contracting Co., St. Louis. REFERENCES: E. T. Clucas, L. L. Hamig, J. F. Naylor, Jr., H. C. Sharp.

LINIMON, O. G., Sales Engr., The Marley Co., Inc., Kansas City. REFERENCES: H. E. Degler, T. I. Harriman, W. O. Kretzmeier, P.E.C. Massaglia.

Montana

ROWE, H. M., Sales Engr., Johnson Service Co., Great Falls. REFERENCES: A. W.

Cooper, E. V. Gritton, D. B. Holford, D. R. Wilde.

Nebraska

△Barnard, H. A., Sr. Partner, H. A. Barnard & Assocs., Omaha. References: S. W. Black, K. E. Martin, Verne Simmonds, O. J. Smith.

†△Hahn, N. L., Pres., American Propane Gas, Inc., Omaha. References: S. W. Black, C. A. Failor, A. O. Jensen, E. A. Snellenberg.

New York

Barrett, T. J., Supt., Hotel Waldorf-Astoria, New York. References: A. A. Bearman, A. A. Giannini, H. B. Hamilton*, H. J. Ryan.

Borak, J. J., Estimator, Dierks Heating Co., Inc., Long Island City. References: H. S. Birkett, John Dierks*, Ernst Graber, Bernard Rahill*.

Christensen, R. G., Mfrs. Repr., Weil Pump Co., New York. References: W. L. Luther*, William Perrie*, R. T. Sheridan*, N. H. Weil*.

Cohn, S. C., Vice Pres., Joyce & Kramer, Inc., Albany. References: C. F. Batchelder, G. G. Davis, F. R. Foote, Joseph Ottenheimer*.

Duffy, W. E., Proj. Engr., Furnace Div., Morrison Steel Products, Inc., Buffalo. References: David Grant*, A. J. Harsch*, G. A. Knerr, W. J. Messingschlager*.

Kaminsky, A. R., Appl. Engr., Bush Manufacturing Co., New York. References: Milton Kalish*, Sherman Loud, N. R. Miller, George Moncher*.

Kluger, R. M., Engr., Wolff & Munier, Inc., New York. References: P. B. Gordon, C. S. Koehler, L. L. Munier, R. A. Wolff.

△Koehler, C. S., N. Y. Mgr., Commercial Div., Minneapolis-Honeywell Regulator Co., New York. References: R. H. Carpenter, P. B. Gordon, J. E. Haines, A. J. Offner.

Marantz, I. H., Chief Engr., Columbia Cable & Electric Corp., Brooklyn. References: H. E. Coffin*, A. W. Daniels*, Russell Donnelly, T. M. Reed, Jr.

Murphy, J. G., Mech. Supt., John Lowry, Inc., New York. References: W. B. F. Drew*, P. B. Gordon, John Lowry, Sr.*, W. J. Murphy*.

△Quinzio, J. R., Plant Engr., American District Steam Co., Inc., North Tonawanda. References: H. D. Bossert*, Roswell Farnham, J. J. Landers, F. J. Weber.

Thurber, W. P., Chief Engr., Water Service Laboratories, Inc., New York. References: C. S. Porter*, W. J. Ryan*, H. L. Shuldener*, K. W. Wheeler*.

North Carolina

Blanton, S. B., Dept. Engr., American Moistening Co., Charlotte. References: L. F. Lawrence, Jr., R. E. Mason, R. O. McGary, E. D. Streng.

Boger, J. P., Engr., Allis Chalmers Manufacturing Co., Charlotte. References: W. W. Avera, J. W. Barr, E. C. Jones, J. A. Rice.

Dings, C. L., Repr., Allis Chalmers Manufacturing Co., Charlotte. References: J. W. Barr, W. H. Reed, III, J. A. Rice, R. M. Warren, Jr.

Ohio

Daugherty, W. J., Dist. Mgr., American District Steam Co., Cleveland. References: E. W. Gray, J. H. Lamb, W. M. Rogers.

Horner, R. H., Mgr., Job Engrg. Dept., The F. W. Wakefield Brass Co., Vermilion. References: C. K. Henriksen, W. T. Miller, T. F. Montgomery, L. G. Seigel.

Rose, R. S., Appl. Engr., York Corp., Cincinnati. References: L. R. Craig, R. W. Geltz*, L. P. Quinlivan, D. J. Wood.

Oklahoma

McCune, G. A., Mech. Engr., McCune & McCune, Tulsa. References: A. D. Holmes, W. R. Lee, V. W. Miles, R. F. Shoemaker.

Oregon

Day, G. C., Sales Engr., Campbell-Norquist & Co., Portland. References: B. W. Farnes, R. W. Martig, J. P. McDermott, E. W. Neubauer.

△Flocke, K. N., Indus. Hygiene Engr., Oregon State Board of Health, Portland. References: A. D. Brandt, B. W. Farnes, Walter Hanthorn, J. D. Kroeker.

Mackey, Martin, Dist. Mgr., H. H. Robertson Co., Portland. References: Dick Blankenship, K. H. Hanson, H. W. McKenzie, Rowland Rose*.

Pennsylvania

Firsching, R. C., Jr. Engr., Air Cond. & Comb. Dept., Dravo Corp., Machinery Div., Pittsburgh. References: R. D. Darrah, E. C. Hach, B. B. Reilly, G. W. Strachan.

Hendrickson, D. V., Sales Engr., V. E. Hendrickson Co., Pittsburgh. References: E. J. Busch, J. H. W. Cleland, M. I. Dorfan, H. H. Thayer.

Jacobs, H. N., Dist. Sales Mgr., Clarage Fan Co., Philadelphia. References: F. H. Buzzard, John Everetts, Jr., C. R. McConner, R. A. Wasson.

Olsen, H. M., Head, Htg. & Vent. Dept., Pierce Phelps Corp., Philadelphia. References: H. E. Miller*, J. P. Moore*, C. M. Phelps*, R. H. Smiles.

Proie, L. A., Proie Brothers, Inc., Pittsburgh. References: P. A. Farey, E. E. Harwood, H. A. Pietsch, M. H. Prestia.

Ray, T. H., Jr., Owner, Thomas Ray & Co., Pittsburgh. References: N. S. Booth, J. W. Mathis, B. R. Small, E. E. Trickler.

Sperry, J. M., Sales Mgr., Htg. Pump Div., Economy Pumps Inc., Div. of C. H. Wheeler Manufacturing Co., Philadelphia. References: E. E. Baker*, M. F. Blankin, C. F. Dietz, L. G. L. Thomas.

Zankey, H. E., Chief Engr., Pittsburgh Lectrodryer Corp., Pittsburgh. References: F. A. Joy, E. R. Queer, G. L. Simpson, B. R. Small.

Rhode Island

†Kramer, Conrad, Engr., Lutz Engineering Co., Providence. References: C. H. Dow, L. B. Mann, C. D. Potter, W. H. Shipp.

South Carolina

Curlee, T. O. Jr., Mgr., Kirk Cousart & Assocs., Greenville. References: Kirkpatrick Cousart, J. DeB. Shepard, J. E. Waldrep, R. M. Warren, Jr.

Tennessee

Morris, H. H., Vice Pres., Lennon Co., Inc., Chattanooga. References: G. S. Campbell, J. E. Lennon*, L. D. McIlwain*, O. D. Riseden*.

Texas

Hathaway, P. L. Jr., Htg. & Vent. Engr., Chance Vought Aircraft, Dallas. References: F. L. Gray, Jr., Fred Manget, Jr., P. N. Vinther, Ross Zumwalt.

Holle, J. P., Partner, Cook & Holle, Cons. Engrs., Houston. References: W. L. Lashley, Jr., J. C. Lewis, C. A. McKinney, H. C. Will.

Virginia

Thompson, A. R., Jr., Asst. Mgr., A. R. Thompson Plbg. & Htg. Contr., Norfolk. References: J. F. Boyenton, E. D. Duval, H. E. Marquart, J. F. Reynolds.

Weisld, C. R., Asst. Chief Engr., Hastings Instrument Co., Inc., Hampton. References: J. E. Harding, C. E. Hastings*, D. E. Phillips, G. J. Sweeney.

Washington

Smylie, R. H., Htg. Supt., Boyker Plbg. & Htg., Seattle. References: V. A. Beers, R. H. Liniger, R. M. Towne, N. W. Wilson.

White, D. E., Vice Pres., Central Service Sales, Inc., Seattle. References: C. W. Brown, W. G. Cox, F. H. Faust, R. M. Stern.

Wisconsin

Crooker, W. G., Appl. Engr., L. J. Mueller Furnace Co., Milwaukee. References: N. E. Hill, H. P. Mueller, F. J. Nunlist, O. J. Ress.

Canada

Bowker, Joseph, Htg. Supt., Saanich Plumbing & Heating, Prince Rupert, B.C. References: M. E. Minaker, Cornelius Van Boeyen, M. Warren*, S. Welch*.

DAVIES, R. G., Field Supvsr., Wiggs, Walford, Frost & Lindsay, Cons. Engrs., Montreal, Que. REFERENCES: W. B. Horswill, D. L. Lindsay, L. C. A. Walford, G. L. Wiggs.

GOULD, K. E., Assoc. Publisher, Age Publications Ltd., Toronto, Ont. REFERENCES: D. L. Angus, M. C. Bailey, William Philip, H. R. Roth.

HUTCHINSON, E. L., Field Engr., Canadian Sirocco Co. Ltd., Montreal, Que. REFERENCES: F. G. Ewens, C. W. Johnson, R. R. Noyes, H. R. Roth.

KLEIN, S. H., Htg., Vent. & Air Cond. Engr., Kolostat Heating Systems Ltd., Montreal, Que. REFERENCES: P. G. Billick, W. C. Isaac, S. S. Segal, M. P. F. Turnau.

△LINDSAY, D. L., Partner, Wiggs, Walford Frost & Lindsay, Montreal, Que. REFERENCES: J. G. Chenevert, R. R. Noyes, L. C. A. Walford, G. L. Wiggs.

MORTON, J. M., JR., Owner, J. Marshall Morton, Mfg. Agent, Vancouver, B.C. REFERENCES: W. E. Gleeson, E. N. McDonnell, R. E. Powers, D. W. Thomson.

RENOUF, E. E., Estimator, Lockerbie & Hole (B.C.) Ltd., Vancouver, B.C. REFERENCES: S. C. Gale, R. W. Hole, R. A. Malcolm, A. C. Martin.

WILLIAMS, E. C., Jr. Partner, Eric Ackland & Assocs. Ltd., Vancouver, B.C. REFERENCES: D. M. Drake, H. R. Roth, E. H. Terrance, D. W. Thomson.

New Zealand

SMITH, R. Q., Engrg. Draftsman, Ministry of Works, New Zealand Government, Wellington. REFERENCES: T. J. Chapman*, F. Duncombe*, I. F. McMillan*, J. Tregurtha*.

STUDENTS

UNIVERSITY OF CONNECTICUT, Storrs, Conn. CERTIFIED BY: C. H. Coogan, Jr.*.
ROSSEAU, R. B.

UNIVERSITY OF DETROIT, Detroit, Mich. CERTIFIED BY: J. E. Lay.
LAWRENCE, C. B.
OSTERMAN, E. J.
PRENTICE, D. L., JR.
THULL, W. F.

UNIVERSITY OF MINNESOTA, Minneapolis, Minn. CERTIFIED BY: J. V. Borry.
HANSON, N. H.
SEGERSTROM, S. L.
YOUNG, T. K.

UNIVERSITY OF TORONTO, Toronto, Ont., Canada. CERTIFIED BY: F. G. Ewens.
BULLOCK, A. P.
CRIBB, K. R.
WICKES, C. D.

YALE UNIVERSITY, New Haven, Conn. CERTIFIED BY: F. W. Keator*.
ELLIOTT, B. J.

YALE UNIVERSITY, New Haven, Conn. CERTIFIED BY: D. R. Olson*.
PECK, P. E.

OBITUARIES

H. J. METZGER
Kalamazoo, Mich.

Henry J. Metzger, president, Wheeler-Blaney Co., Kalamazoo, died in Florida on March 24, where he had gone to recuperate after suffering from a heart ailment for the past several months.

Mr. Metzger was born in Sandusky, Ohio, on April 17, 1885, where he attended St. Augustine High School. He joined the Wheeler-Blaney Co. in 1919 as an estimator and superintendent of heating, ventilating, power plant, and sprinkler work, and in 1938 became vice president and heating superintendent. He became president of the company in 1941.

Mr. Metzger is survived by his widow, to whom the Officers and Council of the Society extend their sincere sympathy.

L. V. DALE
Seattle, Wash.

The Society announces with regret the death of one of its Junior Members, Leland V. Dale, who passed away on April 17, 1952. Although Mr. Dale had been a member of the Society for only two years, he had a good knowledge of fans and fan engineering and had excellent qualifications as an engineer.

Mr. Dale was born on October 21, 1921 at Santa Barbara, Calif. He studied at San Jose State for two years, the University of Texas for a year, specializing in mechanical engineering, and received his B.S. in mechanical engineering from the University of California in 1947.

Upon his graduation he went through the preliminary training with Westinghouse Electric Corp., Sturtevant Division, as sales trainee in factory training on manufacturing, equipment and sales, as sales assistant in office training, estimating, and ordering, and finally became sales engineer for heating, ventilating, and air conditioning equipment.

The Officers and Council of the Society extend their deepest sympathy to his widow, Mrs. Jane Putnam Dale, 1750-19th Ave., San Francisco, Calif.

F. J. KEELER
Fullerton, Calif.

The death of Forrest J. Keeler, heating and ventilating supervisor, Los Angeles Board of Education, on May 28, has been announced by Lind Davenport, secretary of the Southern California Chapter of the Society.

Born in Galva, Ill., in 1886, Mr. Keeler was first associated with the American Heating Co. and the Arthur Hess Co., both in Los Angeles, and in 1917 he became a foreman with Howe Bros., Los Angeles. He later became heating and ventilating foreman for the J. Hokom Co., Los Angeles, and in 1924 became a partner in the firm of Emmerson & Keeler, Los Angeles. In 1931 he went into business for himself as a heating and ventilating contractor, and in 1933 he was appointed as heating and ventilating foreman of the Los Angeles Board of Education. He received the appointment as heating and ventilating supervisor, which position was obtained through Civil Service Examination in 1945, and maintained that post until his death.

Mr. Keeler is survived by a daughter, Mrs. Fred A. Downer, of 329 North Roosevelt Ave., Fullerton, Calif., to whom the Officers and Council of the Society extend their sincere sympathy.

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Headquarters: 62 Worth St., New York 13, N. Y.

OFFICERS

President.....Ernest Szekely
First Vice President.....Reg F. Taylor
Second Vice President.....L. N. Hunter
Treasurer.....J. Donald Kroeker
Executive Secretary.....A. V. Hutchinson
Technical Secretary.....Carl H. Flink

COUNCIL

Ernest Szekely, *Chairman;* Reg F. Taylor, *Vice Chairman.*

Three Years: M. K. Fahnestock, P. B. Gordon, R. T. Kern, D. M. Mills.

Two Years: J. H. Fox, N. H. Peterson, B. H. Spurlock, Jr.; and B. L. Evans (*one year*).

One Year: J. E. Haines, J. W. James, E. R. Queer, G. B. Supple, L. E. Seeley.

ADVISORY BOARD

L. E. Seeley, *Chairman;* Homer Addams, Lester T. Avery, M. F. Blankin, S. E. Dibble, S. H. Downs, E. O. Eastwood, W. L. Fleisher, H. P. Gant, F. E. Giesecke, E. Holt Gurney, L. A. Harding, H. M. Hart, C. V. Haynes, D. D. Kimball, G. L. Larson, S. R. Lewis, A. J. Offner, F. B. Rowley, A. E. Stacey, Jr., G. L. Tuve, A. C. Willard, C.-E. A. Winslow, and B. M. Woods.

COUNCIL COMMITTEES

Executive: L. E. Seeley, *Chairman;* L. N. Hunter, Reg F. Taylor.
Sub-Committee: H. E. Sproull, *Chairman;* C. S. Koehler, Reg F. Taylor.

Finance: J. W. James, *Chairman;* N. H. Peterson, E. R. Queer, J. Donald Kroeker, *Ex-Officio.*
Ways and Means: C. E. Price, *Chairman;* I. W. Cotton, J. A. Cutler, M. K. Fahnestock, E. R. Queer.

Membership: J. E. Haines, *Chairman;* R. T. Kern, D. M. Mills.

Program and Papers: E. R. Queer, *Chairman;* J. H. Fox, P. B. Gordon.

Standards: L. N. Hunter, *Chairman;* B. H. Spurlock, Jr., G. B. Supple.

GENERAL COMMITTEES

Admission and Advancement: A. W. Edwards, *Chairman (one year);* Roswell Farnham *(two years),* W. A. Danielson *(three years).*

Publication: P. J. Marschall, *Chairman;* R. P. Cook, Linn Helander.

Guide: B. H. Jennings, *Chairman;* D. B. Anderson, W. E. Long *(one year);* W. S. Harris, F. J. Nunlist, Jr., C. D. Shields *(two years);* P. R. Achenbach, R. E. Cherne, A. B. Newton *(three years);* I. W. Cotton, *Ex-Officio.*

Charter and By-Laws: E. L. Crosby, *Chairman (one year);* G. W. F. Myers *(two years);* G. D. Winans *(three years).*

F. Paul Anderson: Reg F. Taylor, *Chairman;* C. O. Mackey, G. D. Winans, M. S. Wunderlich, A. J. Offner.

Chapter Relations: G. B. Supple, *Chairman;* D. W. Blair, J. S. Burke, C. R. Davis, A. J. Hess, C. H. Randolph, J. H. Ross.

Chapters Conference: A. J. Hess, *Chairman;* G. W. Bornquist, *Vice Chairman;* W. J. Collins, Jr., *Secretary.* Members and alternate members selected by local chapters are respectively:

ATLANTA: F. A. Player—J. G. Croley
BALTIMORE: F. M. Hewitt—G. B. Priester
CENTRAL NEW YORK: F. E. Krell—D. L. Mills
CENTRAL OHIO: R. S. Curl—A. D. Bogen
CINCINNATI: J. J. Bechtol—H. E. Russell
CONNECTICUT: A. J. Lawless—T. L. Arnold
DELTA: J. S. Burke—Walter Cooke
EMPIRE STATE: D. A. Carofano—
GOLDEN GATE: J. E. Murray—T. J. Janes
ILLINOIS: G. W. Bornquist—M. W. Bishop
INDIANA: C. F. A. Locke—F. C. Barton
INLAND EMPIRE: J. A. Doyle—P. J. Favre
IOWA: C. H. McGuiness—R. H. Schnell
KANSAS: O. P. Bullock—Charles Yoe
KANSAS CITY: W. A. Reichow—G. H. Stoffer
MANITOBA: W. J. Atkinson—A. K. Piercy
MASSACHUSETTS: John Bonner—G. D. Fife
MEMPHIS: C. S. Fisher—H. H. Wilson
MIAMI VALLEY: C. D. Weaver, Jr.—D. L. Bergman
MICHIGAN: G. W. Akers—C. A. Strand
MINNESOTA: E. F. Snyder, Jr.,—William Sturm
MONTREAL: J. G. Chenevert—W. G. Hole
NEBRASKA: S. W. Black—O. J. Smith
NEW YORK: Ernst Graber—P. B. Gordon
NORTH CAROLINA: R. M. Warren—C. Z. Adams
NORTH TEXAS: R. E. Allison—P. N. Vinther
NORTHEASTERN OKLAHOMA: V. W. Miles—J. N. Watt
NORTHERN OHIO: R. E. Sherman—J. M. Black
NORTHERN PIEDMONT: C. Z. Adams—
OKLAHOMA: W. J. Collins, Jr.—F. X. Loeffler
ONTARIO: J. H. Ross—J. H. Fox
OREGON: K. H. Hanson—E. R. Lokey
PACIFIC NORTHWEST: W. B. Pride—R. C. Lewis
PHILADELPHIA: F. H. Buzzard—C. J. Forve
PITTSBURGH: B. B. Reilly—E. H. Riesmeyer, Jr.
ROCKY MOUNTAIN: V. E. Valleto—
ST. LOUIS: L. L. Hamig—C. H. Burnap
SHREVEPORT: R. M. Hood—S. W. Beaty
SOUTH TEXAS: E. G. Floeter, Jr.—C. L. Fleming
SOUTHERN CALIFORNIA: A. J. Hess—
SOUTHERN PIEDMONT: R. M. Warren—
SOUTHWEST TEXAS: V. E. Locher—W. E. Long
UTAH: J. L. ASHTON—
VIRGINIA: M. I. Taylor—
WASHINGTON, D. C.: S. R. Allen—G. R. Walz
WESTERN MICHIGAN: H. R. Limbacher—W. C. DeRoo
WESTERN NEW YORK: T. F. Killeen—J. M. Quackenbush
WISCONSIN: B. M. Kluge—F. J. Nunlist, Jr.

Committee on Research: I. W. Cotton, *Chairman;* R. S. Dill, *Vice Chairman;* Cyril Tasker, *Director of Research.*

Three Years: I. W. Cotton, W. A. Grant, N. B. Hutcheon, B. H. Jennings, C. O. Mackey.

Two Years: A. B. Algren, John Everetts, Jr., R. W. Keeton, M.D., T. H. Smoot, W. N. Witheridge.

One Year: Carl F. Boester, R. C. Cross, R. S. Dill, A. J. Hess, H. A. Lockhart.

Executive: I. W. Cotton, *Chairman;* R. S. Dill, *Vice Chairman;* Carl F. Boester, John Everetts, Jr., C. O. Mackey.

Technical Advisory Committee for 1952:

Air Cleaning: A. B. Algren*, *Chairman;* R. C. Cross*, *Vice Chairman;* R. B. Crepps, R. S. Dill*, L. L. Dollinger, Jr., O. C. Eliason, B. G. Evans, C. Farr, C. D. Graham, A. J. Hess*, A. B. Hubbard, G. F. Landgraf, K. W. MacKenzie, Arthur Nutting, S. L. Root, Jr., C. B. Rowe, W. T. Van Orman, R. P. Warren, W. B. Watterson.

Air Distribution: G. B. Priester, *Chairman;* W. A. Grant*, *Vice Chairman;* J. M. Black, H. F. Brinen, R. M. Conner, S. H. Downs, S. P. Gilman, Linn Helander, F. B. Holgate, W. O. Huebner, W. W. Kennedy, E. J. Kurek, R. D. Madison, G. E. McElroy, L. G. Miller, H. C. Pierce, C. H. Randolph, T. H. Troller, R. D. Tutt, G. L. Tuve.

Combustion: T. H. Smoot*, *Chairman;* P. R. Achenbach, R. B. Engdahl, H. G. Hays, R. C. Johnson, W. B. Kirk, H. R. Limbacher, A. A. Marks, W. M. Myler, Jr., E. A. Norman, Jr., E. O. Olson, K. O. Schlentner, R. K. Thulman, E. C. Webb, D. L. Wooden.

Cooling Load: W. E. Zieber, *Chairman;* C. O. Mackey*, *Vice Chairman;* K. O. Alexander, John Everetts, Jr.*, W. F. Friend, R. H. Heilman, H. W. Heisterkamp, R. C. Jordan, C. F. Kayan, J. N. Livermore, J. P. Stewart.

Heat Flow Through Glass: R. A. Miller, *Chairman;* N. B. Hutcheon*, *Vice Chairman;* W. J. Arner, F. L. Bishop, E. W. Conover, D. D'Eustachio, W. B. Ewing, J. E. Frazier, J. S. Herbert, W. W. McKinley, E. C. Miles, D. R. Muir, F. W. Preston, Vic Sanders, H. B. Vincent, J. R. Young.

Heating Load: W. S. Harris, *Chairman;* B. H. Jennings*, *Vice Chairman;* A. I. Brown, R. S. Dill*, J. M. Hartman, H. A. Lockhart*, L. G. Miller, V. L. Miller, T. F. Rockwell, S. J. Rottmayer, C. W. Signor.

Heating and Air Conditioning as Related to Plant and Animal Husbandry: A. J. Hess*, *Chairman.*

Hot Water and Steam Heating: J. W. James, *Chairman;* H. A. Lockhart*, *Vice Chairman;* R. C. Chewning, H. C. Day, W. S. Harris, L. N. Hunter, A. T. Jones, E. G. Keller, M. W. McKee, N. D. Skinner, S. K. Smith, Benjamin Spieth, M. H. Westerberg.

Human Calorimetry: G. L. Tuve, *Chairman;* I. W. Cotton*, *Vice Chairman;* E. F. DuBois, M.D., Nathaniel Glickman, J. D. Hardy, E. R. Queer, L. E. Seeley, C. P. Yaglou.

Industrial Ventilation: W. N. Witheridge*, *Chairman;* H. A. Mosher, *Vice Chairman;* J. L. Alden, A. D. Brandt, J. H. Clarke, R. B. Foley, W. C. L. Hemeon, W. O. Huebner, J. M. Kane, M. G. Kershaw, G. E. McElroy, B. F. Postman, K. E. Robinson, Leslie Silverman, B. R. Small, R. P. Warren, H. E. Ziel.

Insulation: M. W. Keyes, *Chairman;* N. B. Hutcheon*, *Vice Chairman;* R. E. Backstrom, L. A. Barron, C. B. Bradley, P. D. Close, R. B. Crepps, R. C. Cross*, E. T. Erickson, F. A. Joy, W. A. Knudson, E. R. Queer, R. F. Rea, H. E. Robinson, Vic Sanders, T. D. Stafford, L. V. Teesdale, R. K. Thulman.

Odors: T. H. Urdahl, *Chairman;* W. N. Witheridge*, *Vice Chairman;* Dr. L. H. Beck, Dr. N. E. Berry, Dr. V. G. Dethier, W. A. Grant*, A. B. Hubbard, G. W. Meek, Dr. Sherman Ross, Dr. R. G. H. Siu, Dr. Amos Turk.

Panel Heating and Cooling: P. B. Gordon, *Chairman;* R. S. Dill*, *Vice Chairman;* A. B. Algren*, John Everetts, Jr.*, L. N. Hunter, J. W. James, J. S. Locke, C. O. Mackey*, S. K. Smith, J. M. van Nieukerken.

Group A — Heat Distribution Within and Behind the Panel: R. S. Dill*, *Chairman;* H. L. Flodin, F. E. Giesecke, G. D. Lain, R. L. Maher, V. L. Miller, D. L. Mills, C. W. Nessell, F. E. Parsons, S. J. Rottmayer, R. T. Schoerner, E. E. Scott, S. K. Smith, R. K. Thulman, S. M. Van Kirk, L. H. Yeager.

Group B — Heat Transfer Between the Panel and the Space: J. M. van Nieukerken, *Chairman;* C. O. Mackey*, *Vice Chairman;* C. M. Ashley, C. F. Boester*, W. P. Chapman, W. S. Harris, Linn Helander, J. W. James, A. T. Jorn, C. F. Kayan, H. A. Lockhart*, W. E. Long, R. L. Maher, R. A. Miller, D. L. Mills, G. L. Wiggs.

Group D — Controls: J. S. Locke, *Chairman;* A. B. Algren*, *Vice Chairman;* H. W. Alyea, Louis Barfus, S. D. Browne, R. L. Campbell, C. A. Gustafson, W. J. Hajek, H. H. Kieckhefer, W. H. Kliever, H. T. Kucera, J. F. McCauley, P. F. Neess, J. K. M. Pryke, A. O. Roche, Jr., C. W. Signor, E. P. Snyder.

Physiological Research: M. K. Fahnestock, *Chairman;* R. W. Keeton*, M.D., *Vice Chairman;* Lester T. Avery, Dr. Thomas Bedford, H. C. Belding, William Bruce, Dr. A. C. Burton, E. F. DuBois, M.D., Col. A. P. Gagge, Nathaniel Glickman, F. K. Hick, M.D., J. W. James, D. H. K. Lee, M.D., R. D. Madison, C. L. Taylor, Capt. T. L. Willmon, Dr. C.-E. A. Winslow.

Sensations of Comfort: C. S. Leopold, *Chairman;* John Everetts, Jr.*, *Vice Chairman;* Lester T. Avery, M. K. Fahnestock, Nathaniel Glickman, A. J. Hess*, A. C. Menke.

Sorption: G. L. Simpson, *Chairman;* John Everetts, Jr.*, *Vice Chairman;* G. C. F. Asker, F. C. Dehler, A. S. Gates, Jr., E. W. Gifford, H. W. Heisterkamp, E. R. McLaughlin.

Sound Control: H. A. Lockhart*, *Chairman;* C. M. Ashley, P. H. Geiger, Sidney Gordon, H. C. Hardy, E. M. Herrmann, F. B. Holgate, G. C. Kerr, M. W. Keyes, R. D. Madison, W. L. Rogers, T. H. Troller, T. A. Walters, George Wohlberg.

Public Relations: J. R. Vernon, *Chairman;* Clifford Strock, W. D. Graham, Sr., B. L. Evans.

SPECIAL COMMITTEES

ASHVE *Committee on Code for Testing and Rating Heavy Duty Furnaces:* E. K. Campbell, *Chairman;* Bowen Campbell, R. S. Dill, C. J. Low, W. J. MaGirl, B. F. McLouth, F. L. Meyer, L. G. Miller, F. J. Nunlist, Jr., A. A. Olson, H. A. Pietsch, H. A. Soper.

ASHVE *Committee on Safety Regulations for Heating, Ventilating and Air Conditioning Systems:* G. P. Nachman, *Chairman;* F. H. Buzzard, B. F. McLouth, C. H. Randolph, H. W. McKenzie.

International Joint Committee on Psychrometric Data: Dr. B. M. Woods, Berkeley, Calif., *Chairman;* B. A. Dmitrieff, New York, N.Y., *Secretary;* H. H. Bruce, London; G. A. Bull, London; C. S. Cragoe, Washington, D.C.; John A. Goff, Philadelphia; L. P. Harrison, Washington, D. C.; F. J. G. Henry, Toronto; B. H. Jennings, Evanston, Ill.; Dr. F. G. Keyes, Cambridge, Mass.; R. F. Legget, Ottawa; S. G. Rison, Washington, D.C.; P. A. Sheppard, London; J. L. York, Ann Arbor, Mich.

Joint Committee for Revision of Code of Minimum Requirements for Comfort Air Conditioning: W. L. Fleisher, *Chairman;* (ASHVE) O. W. Armspach, A. C. Buensod, C. Cheyney; (*ASME*) C. F. Kayan; (*ASRE*) F. H. Faust, Vincent Gessel, J. A. Schurman; (*Medical Profession*) E. F. DuBois, M.D., R. W. Keeton, M.D., W. J. McConnell, M.D.

Nominating: M. W. Bishop, Chicago, *Chairman;* D. M. Allen, Kansas City, Mo.; *Vice Chairman;* C. B. Gamble, New Orleans, *Secretary.* A. B. Algren, Minneapolis; B. W. Farnes, Portland, Ore.; E. L. Crosby, Baltimore; W. A. Grant, Syracuse; A. J. Hess, Los Angeles; W. G. Hole, Montreal, Que.; B. M. Kluge, Milwaukee; A. J. Offner, Beechhurst, L.I., N.Y. *Alternate:* G. T. Donceel, Oklahoma City.

*Member of Committee on Research.

JOURNAL SECTION

OFFICERS OF LOCAL CHAPTERS AND STUDENT BRANCHES

(49 Chapters—11 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

● **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, E. N. Pettit, Jr., 904 Wallace Bldg. SECRETARY, R. E. Blaylock, 309 E. Markham St.

● **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, F. A. Player, 2110 Peachtree Rd., N. W. SECRETARY, J. M. Lazenby, 2641 Merry Lane, N. E., (6).

● **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, E. R. Kent, 2322 N. Charles St. (18). SECRETARY, A. M. Kroft, 3935 Stokes Dr. (29).

● **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. PRESIDENT, M. E. Minaker, 1128 Burrard St. SECRETARY, D. W. Thomson, 445 Richards St.

● **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, J. H. Carpenter, 3515 Midland Ave. SECRETARY, H. K. Ormsby, 205 S. Townsend St. (2).

● **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, A. D. Bogen, 330-34 E. Livingston Ave. (15). SECRETARY, J. A. Guy, 219 King Ave. (1).

● **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, H. E. Russell, 4th & Main Sts., Box 960. SECRETARY, F. W. Wilson, 222-24 E. 14th St.

● **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, T. L. Arnold, 26 Francis Ave., Hartford (6). SECRETARY, C. L. L'Hommedieu, 76 Blatchley Ave.

● **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, Walter Cooke, 816 Howard Ave. (13). SECRETARY, T. J. Jenny, 1000 S. Peters St. (9).

● **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. PRESIDENT, Harry Horowitz, 889 Warren St. (3). SECRETARY, R. J. Tougher, Menands Rd., Loudonville, N. Y.

● **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, T. J. Janes, University of California, Dept. of Grounds & Bldgs., Berkeley (4). SECRETARY, J. E. Murray, 1095 Market St. (3).

● **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, M. W. Bishop, Rm. 1504, 228 N. LaSalle St. (1). SECRETARY, G. V. Zintel, 1217 W. Washington Blvd. (7).

● **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, J. T. Hardin, 720 Noble St. (2). SECRETARY, P. O. Patterson, 6300 N. Oakland Ave. (18).

● **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, L. E. Marque, 3803 N. Atlantic. SECRETARY, R. J. Harris, 116 N. Division St., (8).

● **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, R. H. Schnell, 1617 33rd St. (11). SECRETARY, Bowen Campbell, 1435 Casady Dr. (5).

● **KANSAS:** 1951. Hdqrs., Wichita, Kan. PRESIDENT, O. P. Bullock, 254 Laura (7). SECRETARY, H. D. Speyer, 120 Ida.

● **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, W. A. Reichow, 1621 E. 31st St. (3). SECRETARY, J. G. Barnes, Jr., 1924 Oak St.

● **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Third Thursday. PRESIDENT, W. J. Atkinson, 812 Boyd Bldg. SECRETARY, Ernest Lambert, 93 Lombard St.

● **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, G. B. Torrens, 15 Alden Lane, Shrewsbury. SECRETARY, G. D. Fife, 79 Milk St. (9).

● **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, W. L. Drake, 15 N. Reese. SECRETARY, A. T. Bevil, 212 Robinson Bldg., 160 Union (3).

● **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT, D. L. Bergman, Box 95, Riverdale Sta. (5). SECRETARY, D. E. Tullis, 1720 Park Pl. (6).

● **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, C. A. Strand, 9117 Hamilton Ave. (2). SECRETARY, D. S. Falk, 14901 Wilshire Dr. (5).

● **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, William Sturm, 2160 Highland Pkwy., St. Paul (5). SECRETARY, J. G. Hamm, 850 Cromwell Ave., St. Paul (4).

● **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, W. G. Hole, 140 Prince St. SECRETARY, D. L. Lindsay, 1411 Crescent St. (25).

● **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, K. E. Marin, 204 Barker Bldg. (2). SECRETARY, O. J. Smith, 233 Grain Exchange Bldg. (2).

● **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, P. B. Gordon, 222 E. 41st St. (17). SECRETARY, Carl H. Flink, 62 Worth St. (13).

● **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, R. E. Allison, 607-11 First Ave. (10). SECRETARY, M. W. Brown, 1213 Texas Bank Bldg. (2).

● **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. PRESIDENT, C. H. Dollmeyer, Jr., 1533 N. New Haven Ave. (15). SECRETARY, V. W. Miles, 624 So. Boston Ave., Box 871.

● **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, Second Monday. PRESIDENT, John Richmond, 10210 Woodland Ave. (4). SECRETARY, R. G. Huebscher, 7218 Euclid Ave. (3).

● **NORTHERN PIEDMONT:** 1952. Hdqrs. Greensboro, N.C. PRESIDENT, L. L. Vaughan, P.O. Box 5746, Raleigh. SECRETARY, J. W. Bunn, Jr., 2705 Lochmore Dr., Raleigh.

● **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, W. J. Collins, Jr., 1708 Westminster Pl. SECRETARY, F. X. Loeffler, Jr., 1604 N. W. Fifth St.

● **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, J. H. Ross, 1251 Yonge St. SECRETARY, H. R. Roth, 57 Bloor St., W.

● **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, K. E. Hanson, 104 S.E. Seventh (14). SECRETARY, W. R. Norte, P.O. Box 3918.

● **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, W. B. Pride, 5111 Dose Ter. (44). SECRETARY, I. L. Winsor, 105 Orcas St. (8).

● **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, M. E. Barnard, 12 S. 12th St. (7). SECRETARY, C. J. Lubking, 5060 Wayne Ave.

● **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, B. B. Reilly, Fifth & Liberty Aves. (22). SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).

● **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, N. H. Brickham, 2715 S. Humboldt St. (10). SECRETARY, A. S. Widdowfield, 1925 Blake St. (2).

● **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, L. L. Hamig, 1706 Olive St. (3). SECRETARY, J. F. Naylor, Jr., 2535 S. Grand Ave. (4).

● **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, R. M. Hood, 411 Louisiana Ave. SECRETARY, M. A. Hudson, 4609 Gilbert Dr.

● **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, C. I. Fleming, 809 M. & M. Bldg. SECRETARY, J. W. Holland, Esperson Bldg. (2).

● **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, M. C. Greiner, 1559 Club View Dr. (24). SECRETARY, L. B. Davenport, 137 S. Anderson St. (33).

● **SOUTHERN PIEDMONT:** 1952. Hdqrs. Charlotte, N.C. PRESIDENT, R. M. Warren, Jr., P.O. Box 1755, Charlotte. SECRETARY, J. A. Rice, P.O. Box 1755, Charlotte.

● **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, W. E. Long, Dept. of Mechanical Engrg., University of Texas, Austin. SECRETARY, L. H. Hornor, Jr., 810 Insurance Bldg.

● **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, First Wednesday. PRESIDENT, D. R. Wilde, 2634 S. 19th E. (1). SECRETARY, Alfred Richeda, P.O. Box 479 (9).

● **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, D. E. Phillips, P. O. Box 674, Newport News. SECRETARY, H. E. Marquart, 111 W. Main St. (10).

● **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, S. R. Allen, 942 Washington Bldg. (5). SECRETARY, P. H. Loughran, Jr., 4513 49th St., N.W. (16).

● **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, Second Monday. PRESIDENT, H. R. Limbacher, 760 Vine St., E. Kalamazoo. SECRETARY, F. K. Platt, 444 Montrose Ave., Kalamazoo.

● **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, J. M. Quackenbush, 505 Franklin St. (2). SECRETARY, Q. P. Thompson, 238 Barton St. (13).

● **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, J. A. Lofte, 2505 N. 97th St., Wauwatosa (10). SECRETARY, I. J. Rossiter, 231 W. Wisconsin (3).

STUDENT BRANCHES

● **COLLEGE OF CITY OF NEW YORK:** 1949. Hdqrs., New York, N. Y.

● **LOUISIANA POLYTECHNIC INSTITUTE:** 1949. Hdqrs., Ruston, La. PRESIDENT, W. G. McMullen, Box 472, Tech Station. SECRETARY, R. L. Gorton, Box 184, Tech Station.

● **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Sydney Narvey, 5-B Vetville, State College Station. SECRETARY, E. A. Travis, Jr., P.O. Box 3333, Bagwell Dormitory.

● **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, Stuart Cohen, 513 ½ Knoblock. SECRETARY, H. G. Rice, 5 Chickasha, Box 417, Vets Village.

● **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, D. W. Blair, 225 W. 15th St. SECRETARY, C. D. Cannon, 404 N. 26th St.

● **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, N. J. Kirch, 922 Highland Ave., Lafayette. SECRETARY, H. F. Allen, Jr., 629 University St.

● **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station. Meets, Second and Fourth Tuesday. PRESIDENT, J. O. Kadel, Box 4054. SECRETARY, W. C. Haggard, Box 5227.

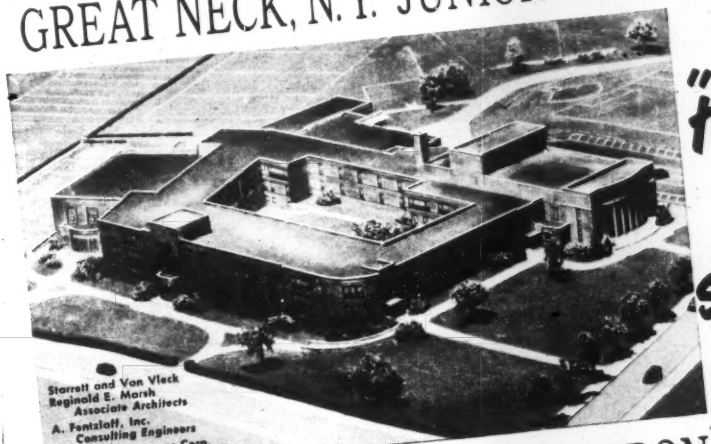
● **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, G. H. Williams, 18251 Washburn (21). SECRETARY, R. H. Drake, 5598 Hurlbut (13).

● **UNIVERSITY OF KANSAS:** 1949. Hdqrs., Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.

● **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday. PRESIDENT, W. A. Cox, 360-D Deep Eddy Apts. SECRETARY, V. H. Miles, PHP Dorm J.

● **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, J. A. Slemin, 21 Wilbeston Rd. SECRETARY, T. O. Smith, 455 Avenue Rd.

GREAT NECK, N.Y. JUNIOR HIGH SCHOOL gets



Starrett and Van Vleck
Reginald E. Marsh
Associate Architects
A. Fantzlatt, Inc.
Consulting Engineers
Heating Maintenance Corp.
Heating Contractors

"the best in steel boiler heat"

THREE 30360 Sq. Ft. FITZGIBBONS BOILERS

insure comfortable warmth with maximum fuel economy in this big, modern school. It's one of many recent installations of Fitzgibbons boilers in important buildings in New York State. Fitzgibbons boilers are increasingly the choice for institutional, commercial and municipal-housing jobs because of their high heating efficiency, quick-steaming, and reputation for many years of trouble-free service. Be sure of these important benefits on your next job. Catalog data gladly sent. Let us help you specify "Fitzgibbons."

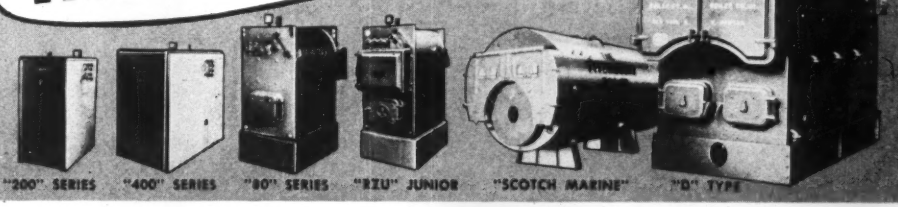
MOST ECONOMICAL IN FUEL
1886
THE FITZGIBBONS BOILER
SINCE 1886

Fitzgibbons Boiler Company, Inc.
General Offices: 101 PARK AVENUE, NEW YORK 17, N. Y.
Manufactured at OSWEGO, N. Y. • Branches in Principal Cities

SBI

A steel boiler is a lifetime investment
—sell "the best in steel boiler heat"—

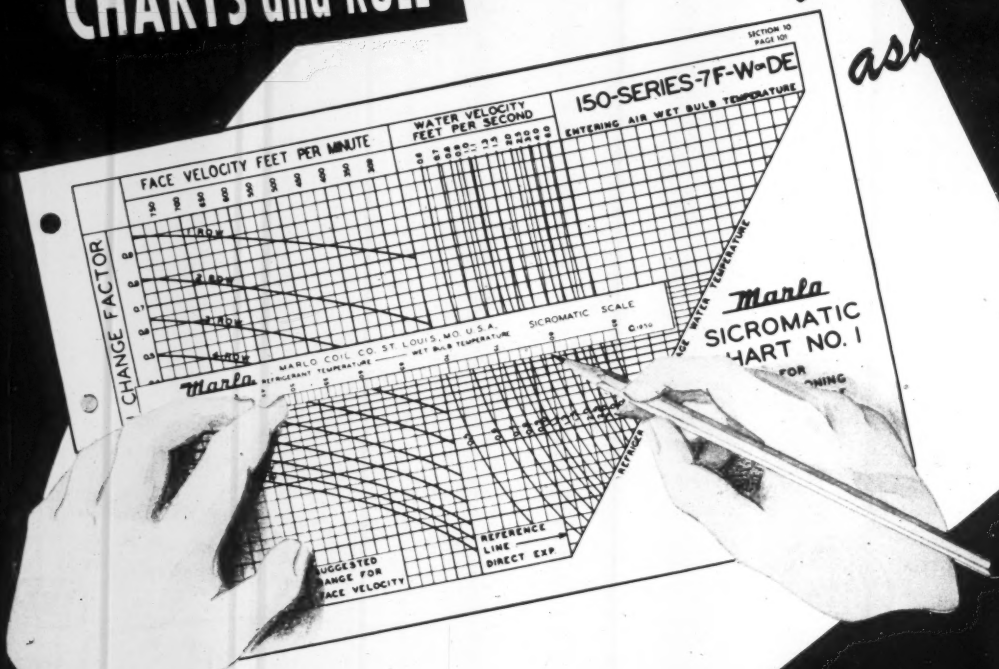
THE FITZGIBBONS BOILER®



"200" SERIES "400" SERIES "80" SERIES "RZU" JUNIOR "SCOTCH MARINE" "D" TYPE

Really New

Marlo SICROMATIC CHARTS and RULE



helps you make
in a matter of sec

you can save time and money . . .
ed calculations and as

+

...

brand-new

Marlo

COOLING COIL

BULLETIN

hensive new cooling coil

ows design, construction,

l data and

MARLO COIL COMPANY

6135 MANCHESTER • ST. LOUIS 10, MISSOURI

Please send your new Sicromatic Chart combination and cooling coil bulletin to:

Name_____ Position_____

Company_____ Address_____

City_____ Zone_____ State_____

They're DROP FORGED

of STEEL...

W-S Screw-End and Socket-Weld Fittings

There are several big benefits to you implied in this simple statement of fact about W-S Fittings.

First, forging means *strength*—the strongest, most compact physical form, steel for steel, obtainable by commercial methods of fabrication.

Second, *being* stronger, forged fittings are much *smaller* and *lighter*, size for size, than other types.

Third, *dimensional accuracy* is characteristic of the forging process—and because forged bodies *are* more accurate, they chuck better, can be machined to *closer*, more *uniform tolerances* than other types.

To these inherent advantages of *forged* fittings, add Watson-Stillman's modern manufacturing facilities, a production control system that's air-tight from furnace to finished product, and a sales engineering staff dedicated to SERVICE in the largest sense of the word. The total is heavily weighted in favor of the advantages of W-S Double-Diamond Forged Steel Fittings.

• Lower Service Cost • More Uniform
• Stronger • Smaller • Lighter • Tighter

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

WATSON-STILLMAN
ESTABLISHED 1848

W S

9-M-1

DISTRIBUTOR PRODUCTS DIVISION

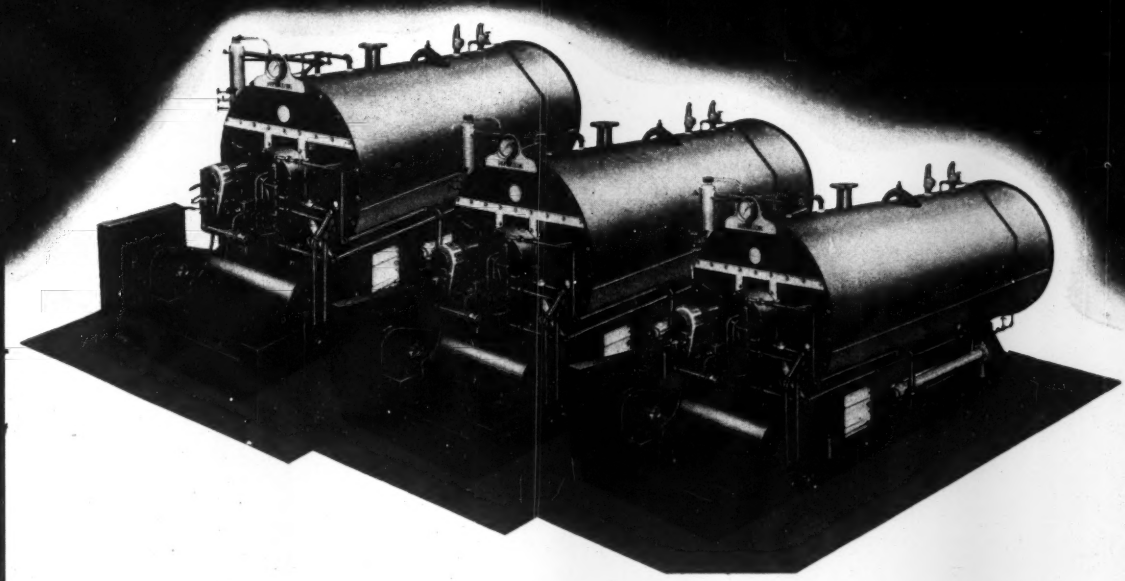
ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

1+1+1=7

WHEN YOU'RE COUNTING

Superior



Battery installations of Superior Steam Generators provide extreme flexibility to meet the most widely fluctuating steam demands. A hospital installation illustrates the point.

From early June through September, steam demand is limited to the needs of hot water and sterilization. Any one of the three units carries this load with ease . . . and at higher efficiency than could be obtained by minimum operation of a larger boiler.

When cold weather adds its heating load, a second Superior Steam Generator is fired. Only the most severe weather demands firing the third unit . . . which throughout the rest of the year provides stand-by equipment which is desirable in any operation.

By employing different combinations of the three, (7 in all) allowing each unit in turn to share the load; all enjoy longer life at maximum efficiency . . . and by using only the number dictated by the steam demand, maximum economy at every stage of steam demand is assured.

Let us show you how battery installation can serve you better in your new plant . . . or augment your present steam facilities.

Write today for Catalog 404.

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS

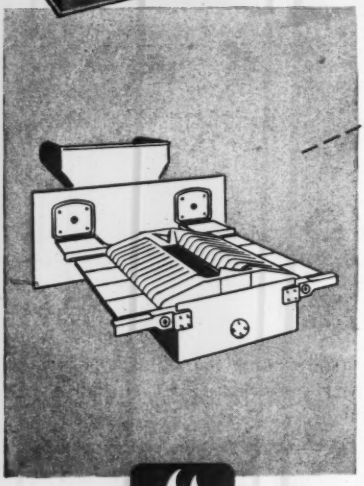
SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N.Y.

Why not buy a stoker that will burn either...

ANTHRACITE

or

BITUMINOUS



The C-E Skelly Stoker will burn satisfactorily *all* grades of bituminous coal as well as the smaller sizes of anthracite. Think what this means in terms of lower fuel bills. No longer are you limited to the more expensive, better grades of coal. The C-E Skelly Stoker permits the use of the most economical type of coal available in your locality. This flexibility in the choice of coals enables you to keep your heating costs at a minimum. In fact, it makes your purchase an *investment* rather than an *expense*.

When you consider that the cost of fuel burned on a stoker often greatly exceeds the initial cost of the stoker itself, it becomes quite evident that the range of coals a stoker will burn *effectively* is a far more important consideration than the purchase price.

Moreover, the C-E Skelly Stoker assures top performance with minimum maintenance. For this stoker reflects the practical knowledge of fuels and operating conditions that Combustion has acquired in installing over 20,000 stokers of all types above residence size.

You can turn to C-E with complete confidence that you are purchasing a stoker that you can rely upon for years of dependable, economical service. Why not investigate the C-E Skelly Stoker for your next installation?

B-566

C-E

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

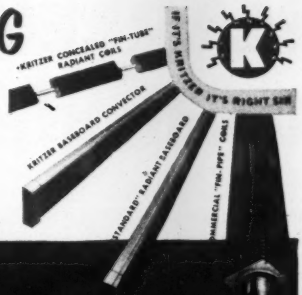
COMBUSTION ENGINEERING — SUPERHEATER, INC.

200 Madison Avenue, New York 16, N. Y.

In buildings that have EVERYTHING

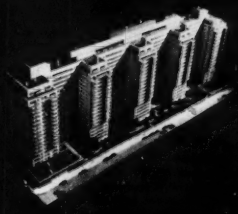
THE HEATING IS BY

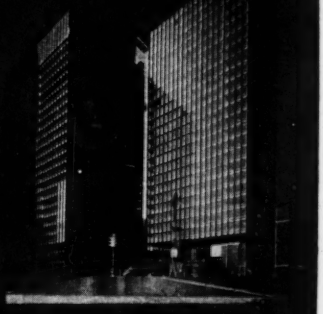
KRITZER


KRITZER CONCEALED "FIN-TUBE" RADIANT COILS
KRITZER BASEBOARD CONVECTOR
"STANDARD" RADIANT BASEBOARD
COMMERCIAL "FIN-PIPE" COILS
IF IT'S A KRITZER IT'S RIGHT SIR

Here are five examples of all that is new in building. Together they are proof of the fact that the tried and proven designs of **KRITZER FIN-PIPE RADIATION** make it easy to engineer installations to meet any heating requirements. Further, the manner in which Kritzer products have been used to solve these heating problems demonstrates the inherent flexibility of Kritzer products.

SEE YOUR JOBBER FOR KRITZER PRODUCTS





AVAILABLE NOW, completely new fact-filled catalog on Kritzer Fin-Pipe Radiation. Write for your copy today, or use the handy coupon.

KRITZER RADIANT COILS, INC.
2901 W. Lawrence Ave., Chicago 25, Illinois

Please send me detailed literature on the products checked below:

- ☐ Kritzer Fin-Pipe Coils
- ☐ Kritzer Radiant Panel Heating
- ☐ Kritzer Radiant Baseboard
- ☐ Have a Representative Call

*Name*_____
*Firm*_____
*Street*_____
*City*_____

KRITZER REPRESENTATIVES ARE LISTED IN LOCAL CLASSIFIED DIRECTORIES

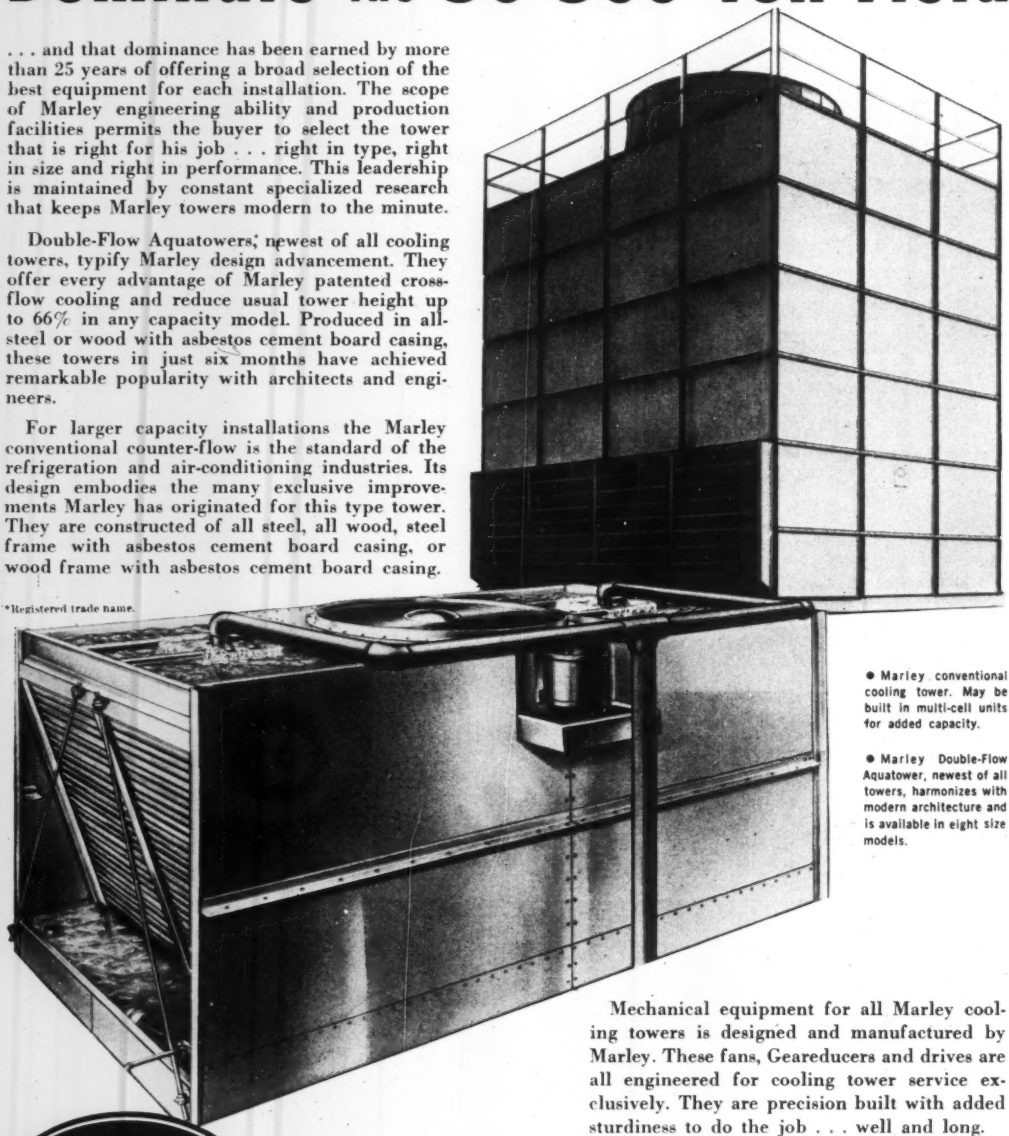
MARLEY Cooling Towers Dominate the 50-500 Ton Field

. . . and that dominance has been earned by more than 25 years of offering a broad selection of the best equipment for each installation. The scope of Marley engineering ability and production facilities permits the buyer to select the tower that is right for his job . . . right in type, right in size and right in performance. This leadership is maintained by constant specialized research that keeps Marley towers modern to the minute.

Double-Flow Aquatowers,* newest of all cooling towers, typify Marley design advancement. They offer every advantage of Marley patented cross-flow cooling and reduce usual tower height up to 66% in any capacity model. Produced in all-steel or wood with asbestos cement board casing, these towers in just six months have achieved remarkable popularity with architects and engineers.

For larger capacity installations the Marley conventional counter-flow is the standard of the refrigeration and air-conditioning industries. Its design embodies the many exclusive improvements Marley has originated for this type tower. They are constructed of all steel, all wood, steel frame with asbestos cement board casing, or wood frame with asbestos cement board casing.

*Registered trade name.



● Marley conventional cooling tower. May be built in multi-cell units for added capacity.

● Marley Double-Flow Aquatower, newest of all towers, harmonizes with modern architecture and is available in eight size models.

Mechanical equipment for all Marley cooling towers is designed and manufactured by Marley. These fans, Geareducers and drives are all engineered for cooling tower service exclusively. They are precision built with added sturdiness to do the job . . . well and long.

MARLEY

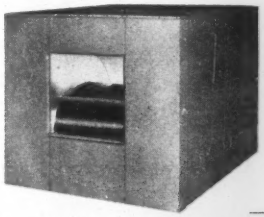
The Marley Company, Inc.

KANSAS CITY 5, MISSOURI

Comfort Air Washer

FOR EVERY COOLING•NEED

a Better Product doing a Better Cooling Job



4 practical sizes built to deliver full-rated capacity of triple-washed, cool, filtered, fresh air per minute, all season long.

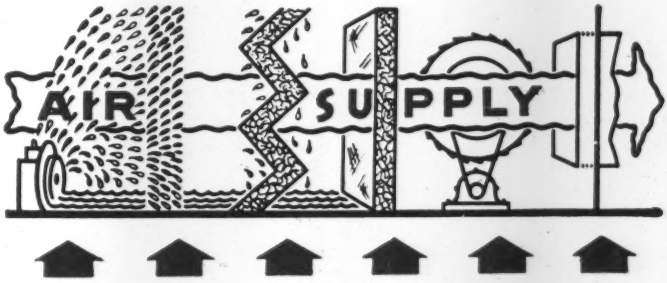
Model	CFM	Motor	
35 AW	3500	½ h.p.	Spray-wheel motors
50 AW	5000	1 h.p.	for all models, ⅓
75 AW	7500	2 h.p.	h.p.—single or
100 AW	10,000	3 h.p.	three-phase

These Better Basic Features Distinguish the AIR WASHER

- All incoming air washed of dust and dirt, filter pads remain unclogged . . . cooling efficiency stays high and uniform.
- Comfort Spray-Wheel provides coninuous sheet of mist and heavy water over pad surfaces. No pumps, no spray nozzles . . . trouble-free.
- MORE PAD AREA (stair-stepped in design) permits lower velocities, lower resistance and higher efficiency.
- FIBERGLAS (Reg.) PADS throughout — vegetable and fungi odors eliminated.
- Non-splash louvres eliminate back-splashing of water.
- Rust-proof construction, durable, attractive hammer-enamel finish outside.
- Self-aligning graphite bronze pillow blocks, wool felt, packed deep to provide long, trouble-free Air Washer Service.

Comfort Air Washer . . . *THE COOLING UNIT THAT MEANS PROFIT FOR YOU*

Diagramatically here's the way the Comfort Air Washer works—



Comfort-Engineered, non-clogging spray-wheel atomizes water for proper washing of air

Continuous wall of atomized water filters, cleans, and completely drenches

Stair-step FIBERGLAS (Reg.) filter unit supports no organic growth

Baffle filter for humidity control

Properly sized HEAVY-DUTY BLOWER (cog-belt driven). Full-size motor maintains full-rated air supply

Adequate static pressure available at blower outlet for duct systems

For further information write to . . .

COMFORT PRODUCTS CORP.
2220 LAMESA • DALLAS, TEXAS

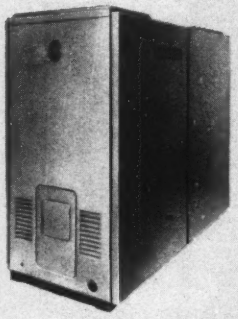
IT'S EASY TO SELL C-O-M-F-O-R-T

"Here's the ultimate in year 'round conditioning...with independent humidity control"

says S. H. Baldwin,

S. H. Baldwin and Company, Lubbock, Texas

"Recommending all-weather conditioning to a homeowner is like selling a man a Cadillac. While thousands will buy, all have to be sold on the *extra* values. That's where the Bryant All-Weather Conditioner fits into the picture! Not only does it control the temperature, but *closely* controls the *humidity*, too . . . a brand new development in residential air conditioning. With the Bryant it's even possible to *remove excess moisture* from the air *without lowering room temperature*. Completely automatic, the All-Weather Conditioner heats, humidifies, cleans and gently circulates the air when warmth is needed; also cools, dehumidifies (then reheats, if necessary) the air for summer comfort. Independent, automatic humidity control takes the Bryant out of the "me too" class of year 'round conditioning. Naturally, many other features have made Bryant tops in the field. If you want the *ultimate* in year 'round conditioning, get acquainted with the Bryant All-Weather Conditioner. Your Bryant distributor has the facts, or write Bryant Heater Division, Dept. 124, Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland, O.

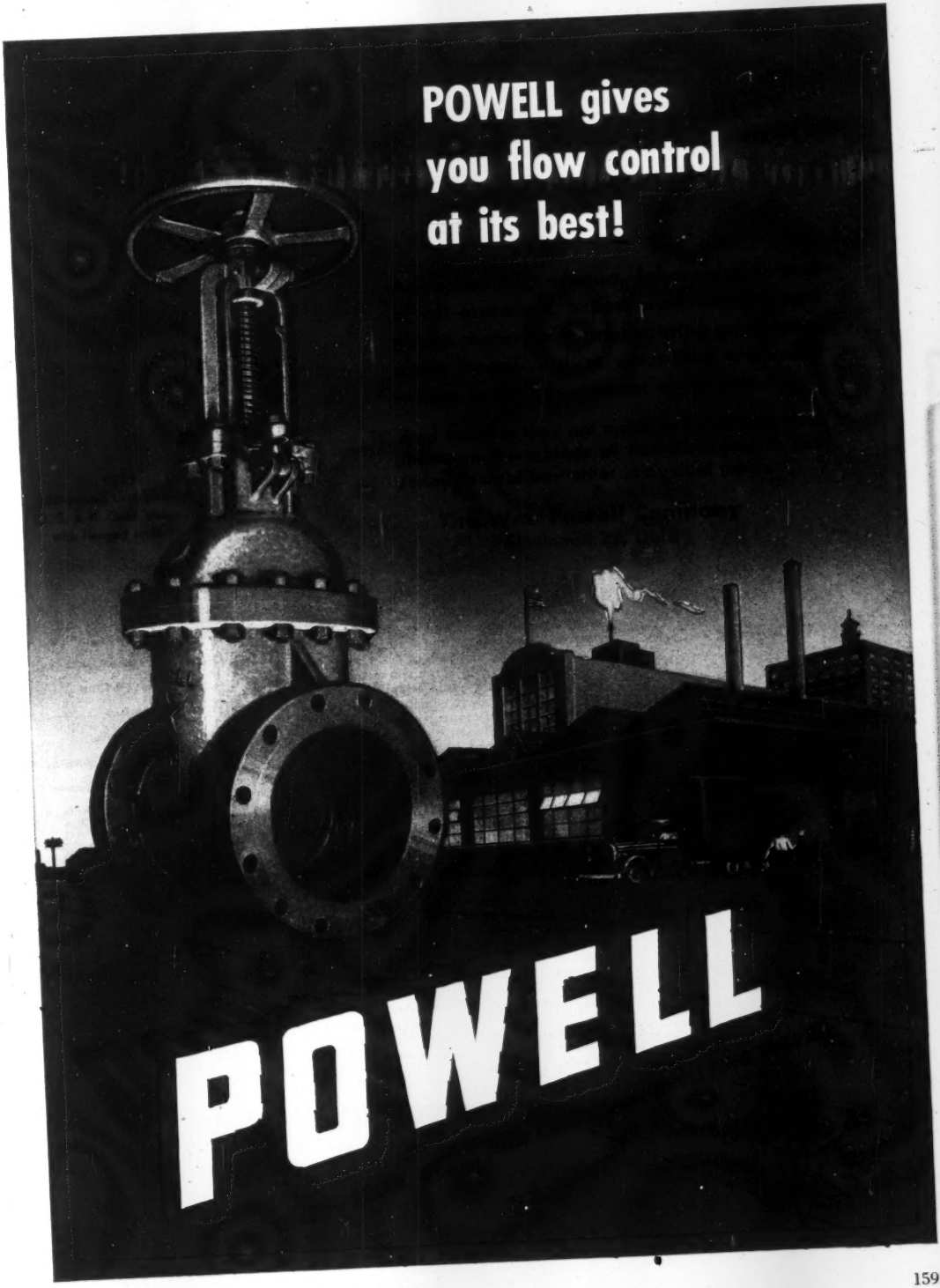


BRYANT
ALL-WEATHER
CONDITIONER

Sizes 3- and 5-ton cooling capacity. Total heating input 150,000 BTU/Hr. in the smaller model, 200,000 in the larger size. Units available for electrical power from 208 to 230 volts, 1 or 3 phase 50 to 60 cycles. AGA approved and Underwriters' listed.

bryant® *best buy*

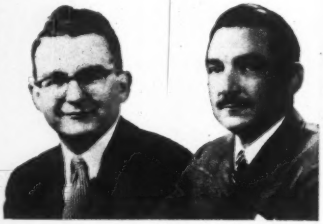
IN HEATING,
AIR CONDITIONING,
WATER HEATING

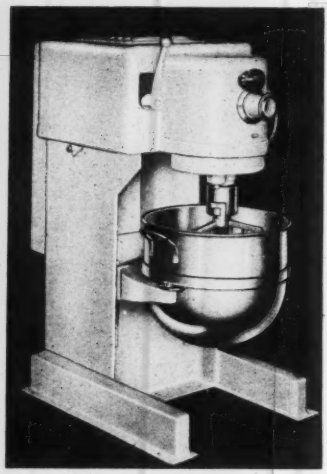

POWELL gives
you flow control
at its best!
POWELL

The Triumph Manufacturing Co.

"Galley duty in the Navy requires a motor control as rugged as the machine"

say Sheldon B. Storer (right) and Samuel T. Bryant (left), Sheldon Storer & Associates, Cincinnati, Ohio, representatives, Ward Leonard Electric Company.





This Triumph vertical "kitchen" machine is used by the Navy for everything from mixing dough to cutting French-fried potatoes, grinding coffee, sharpening cutlery.

Such machines are operated by a wide variety of people wherever naval vessels or installations are found and it is essential to keep them in operation with a minimum of down-time.

In order to meet exacting Navy standards, Triumph consulted Ward Leonard for a motor control. Because of their long experience and excellent record in the production and development of Navy controls of many types, Triumph was assured that Ward Leonard could supply them with sturdy, trouble-free equipment which would match the construction of their ruggedly built machines.

The Ward Leonard controllers used by Triumph vary depending on whether the power supply is a-c or d-c. For d-c applications they are Ward Leonard, Bulletin 4556, across-the-line starters, magnetic type, continuous duty, semi-automatic operation with overload and low voltage protection, drip-proof enclosure and spray-tight push-button station; Bulletin 4651, is the equivalent for a-c applications.

Complete operating and maintenance instruction books were supplied the Navy as a result of the team work of William Leuze, chief engineer of Triumph, and Samuel Bryant of Ward Leonard.

Ward Leonard field engineers are always ready to work with you to solve your electrical control problems. When your production demands exact engineering, quality manufacturing, prompt, efficient handling and shipping, call on Ward Leonard.

DISTRICT OFFICES AND REPRESENTATIVES

Atlanta 5, Georgia	C. B. Rogers and Associates
Baltimore 18, Md.	Durling Electric Co.
Charlotte 1, N. C.	James L. Highsmith & Co.
Chicago 4, Illinois	Ward Leonard Electric Co.
Cincinnati 2, Ohio	Sheldon Storer and Assoc.
Cleveland 14, Ohio	The Ambos-Jones Co.
Corpus Christi, Texas	Branco-Krachy Co., Inc.
Denver 2, Colorado	Mark G. Mueller
Detroit 21, Michigan	Jesse W. Eakins Co.
Hartford 6, Conn.	Ward Leonard Electric Co.
Houston 1, Texas	Branco-Krachy Co., Inc.
Kansas City 2, Mo.	Maury E. Battis Co.
Knoxville, Tennessee	John G. Pattyjohn
Los Angeles 13, Calif.	Ward Leonard Electric Co.
Memphis 3, Tenn.	E. E. Torkell
Minneapolis 5, Minn.	Marvin H. Kirkeby
Newark 2, N. J.	Ward Leonard Electric Co.
New Orleans 13, La.	Electron Engineering Co.
Philadelphia 2, Pa.	Ward Leonard Electric Co.
Pittsburgh 16, Pa.	W. A. Bittner
Roanoke, Virginia	Lynn H. Morris
Rochester 7, N. Y.	Ward Leonard Electric Co.
St. Louis 10, Mo.	Ward Leonard Electric Co.
Salt Lake City 1, Utah	Leonard M. Slusser
San Antonio, Texas	Branco-Krachy Co., Inc.
San Francisco 3, Calif.	L. F. Church Co.
Seattle 4, Wash.	Northwestern Agencies, Inc.
Tucson, Arizona	Control Station Equipment Co.
Washington 5, D. C.	Federal Engineering Co., Inc.

CANADA

Edmonton, Alta.	D. M. Fraser, Ltd.
Halifax, N. S.	D. M. Fraser, Ltd.
Montreal 25, P. Q.	D. M. Fraser, Ltd.
Toronto 1, Ont.	D. M. Fraser, Ltd.
Vancouver, B. C.	D. M. Fraser, Ltd.
Winnipeg, Man.	D. M. Fraser, Ltd.

EXPORT

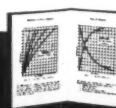
New York 4, N. Y.	Ad. Auriema, Inc.

WARD LEONARD ELECTRIC COMPANY

MOUNT VERNON, NEW YORK

RHEOSTATS · RELAYS · MOTOR CONTROLS · CHROMASTER

Result-Engineered Controls Since 1892



Ward Leonard's complete engineering textbook, "Handbook of Power Resistors," $3. per copy.

Air Foil

AG-35 VOLUME CONTROLLER

NEW... REDUCES ADJUSTMENT TIME and LABOR 90%

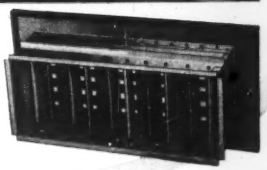
BALANCE SYSTEM WITHOUT REMOVING GRILLE

This means that plaster or paint is never damaged or smudged during balancing. Key-operator regulates air volume to hairline adjustment.

ONE-UNIT GRILLE and VOLUME CONTROLLER

COMBINE AG-35 with any AIRFOIL grille for complete one-unit handling.

PERFECT 4-WAY AIR CONTROL
Light weight—easy to handle—easy to install.



VOLUME CONTROL LOUVERS MOVE SIMULTANEOUSLY IN OPPOSITE DIRECTIONS—CLOSE TO ANY DEGREE DESIRED FROM FULL OPEN TO FULL CLOSED

Installers balance an air-conditioning system in *one-tenth the ordinary time* with amazing, new AIRFOIL AG-35.

There are no grilles to remove. *Workman's hands never touch grille or wall to leave dirty, expensive smudges.* Blades adjust faster—easier. Close more tightly.

Louvers do not close flat as in common styles using damper but *close at 45°.* This maintains a metering control down to the final moment of closure with a minimum disturbance of the air pattern.

Remember—there is *one unit to install—one unit to handle—one unit to purchase* when the air guide volume adjuster is combined with an AIRFOIL grille.

AIRFOIL Grilles are the most efficient ever designed. They are priced to enable you to use a superior product at lower cost. Get complete information at once.

FREE

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

- ☐ Air-conditioning outlets
- ☐ Return air grilles and registers
- ☐ Volume controllers
- ☐ Perforated metal and ornamental grilles
- ☐ Door ventilators
- ☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

- ☐ RUSH information on AG-35
- ☐ Send complete catalog.
- ☐ Send literature on above checked items.

NAME_____

ADDRESS_____

CITY_____ STATE_____

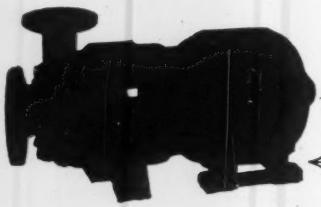
They Weren't Stubborn... They Just Didn't Believe It Was Impossible

Thank goodness there are still fellows around who aren't satisfied with just "good enough"!

Most people in the air conditioning trade figured that the various types of pumps used to recirculate water in air conditioning systems were doing a good job. And when compared, pump for pump, this was true. But then some hard-to-convince engineers at I-R reasoned that if they could design a *smaller* pump that would do the same work as ordinary pumps of *higher* horsepower . . . *that* would really be something. Such a pump would save on first cost. It would have the operating economy of a *smaller* pump. Also, it would bring down installation costs, while doing a better all-around air conditioning job.

So the "unbelieving engineers" at I-R went to work. When they told us, "Here it is," the skeptics wanted proof. Then they showed us improvements in design, construction and materials. What's more, they produced a line of Ingersoll-Rand MOTORPUMPS which, size for size, proved to be *more efficient and reliable* than any other type pump on the market!

The I-R MOTORPUMP has already opened the eyes of many architects, designers, and air conditioning contractors. It's available out of warehouses across the country. And these same outlets offer service on every I-R MOTORPUMP specified or installed. Get the facts now . . . ask your nearest I-R distributor or representative about them. Meantime, write for free descriptive literature. Ingersoll-Rand Company, 11 Broadway, New York 4, New York.



Ingersoll-Rand

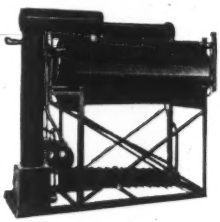
90 years of BIG PUMP know-how packed into **small pumps** for air conditioning applications

MOTORPUMP

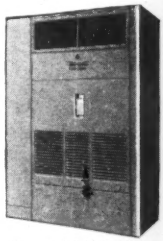
615-9

"I like to sell Servel Air Conditioning because it practically services itself."

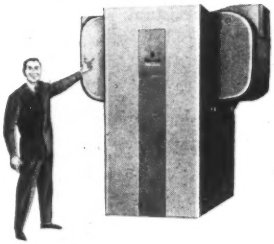
Only Servel Gives All These Sales-Winning Extras!



25-Ton Water Chiller



Commercial Unit where no ducts are needed



All-Year Air Conditioner

SELL SERVEL . . . the air conditioning that offers low operating cost, guaranteed dependability in residential, commercial or industrial installations.

Servel

AIR CONDITIONING

Made by the makers of the famous Servel Refrigerator

SERVEL, INC. • Evansville 20, Indiana

Here's the one Air Conditioning that helps sell itself and helps keep itself *sold!* No other refrigeration unit offers all the Servel features . . . no other unit offers such amazing, trouble-free service. This is the famous equipment that has no compressor . . . no moving parts, no vibration, no noise . . . for minimum maintenance, minimum service on your part. (Refrigerating unit carries a factory guarantee of five full years.) This is the famous equipment that uses *heat* to create *cold*—can be connected to present steam source under any pressure; operates on gas, oil, LP gas, even waste heat! You can select the most economical energy source to keep operating costs low. Refrigerant is water in a pressure-free unit for complete safety. Get the facts today—there is a full range of Servel Air Conditioning Equipment so you can sell every prospect from the residential and small commercial buyer to the large commercial, industrial and military type installation.

Get the facts and you'll sell Servel! Write for complete information *today*.

Servel, Inc., Dept. HPAC-7, Evansville 20, Indiana

Gentlemen: I'm interested in the money-making advantages of selling Servel Air Conditioning Equipment. Send me full details on ☐ Industrial ☐ Commercial Units.

Name.....

Firm.....

Address.....

City.....*Zone*....*State*.....

DEPENDABLE WATER SUPPLY FOR PLANTS AND BUILDINGS FROM THE VERSATILE PEERLESS CHAMPION PUMP

PEERLESS PUMPS

Install it for long life and high efficiency in lifting water up to 200 feet from small drilled wells 4" in dia. and larger

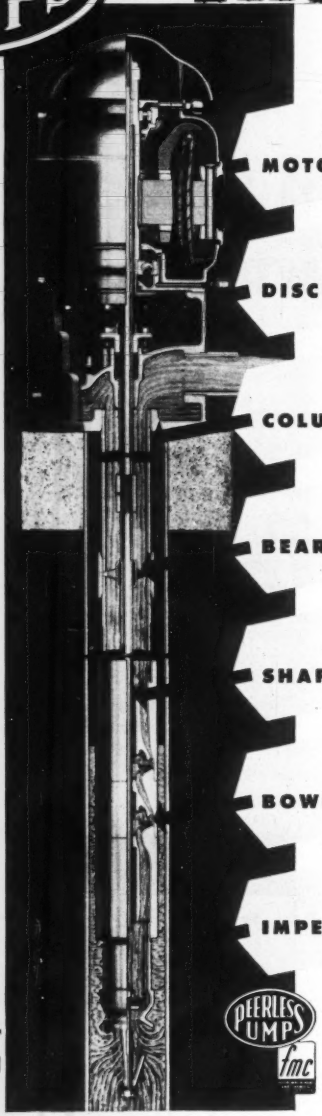
The Peerless Champion has an outstanding success record in supplying water for almost every type of commercial and industrial business. You can buy and apply this economical pump with confidence. Look at all the outstanding features in the Champion that make it your best buy for a dependable water supply. ***FOR EXAMPLE:***

ALL TYPES OF DRIVES

CAPACITIES: Up to 5000 Gals. Per Hr.
LIFTS: Up to 200 Ft.
PRESSURES: Up to 90 Lbs.

A PEERLESS CHAMPION PROVIDES PRESSURE WATER SUPPLY FOR:

Commercial Buildings
Domestic Applications
Industrial Processes
Dairies
Bottling Works
Air Conditioning Applications



MOTOR...
Vertical, hollowshaft electric drive head of standard make. Weather-proof.

DISCHARGE CASTING...
High grade cast iron with efficient and trouble-free packing gland.

COLUMN...
Full weight steel pipe. Accurately threaded and faced for permanent alignment.

BEARINGS...
Long, water-lubricated cutless rubber bearings —abrasion and sand resistant.

SHAFTING...
Precision ground, stainless steel; ends accurately threaded and faced.

BOWLS...
Porcelain enameled; scientifically designed to assure smooth water passage.

IMPELLERS...
High efficiency, semi-open type; high quality bronze insures extended life.

Write today for Bulletin B-200-1

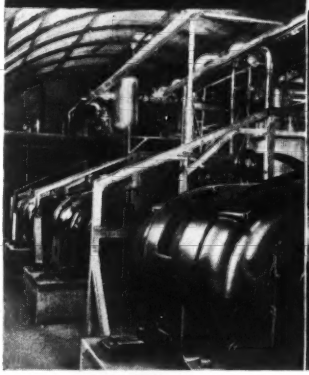
PEERLESS PUMP fmc

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Los Angeles, California, and Indianapolis, Indiana
Offices: New York, Atlanta, Chicago, St. Louis, Phoenix, Fresno, Los Angeles; Dallas, Plainview and Lubbock, Texas; Tulsa; Albuquerque, N. M.
Distributors in Principal Cities; Consult your Telephone Directory

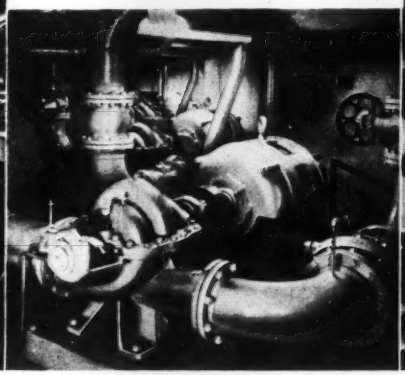
Large or Small...

Century MOTORS

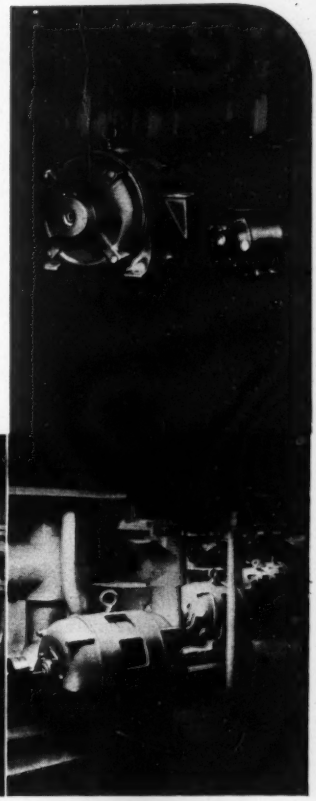
Are Designed to Provide All the Performance That Is Built Into the Machines They Drive



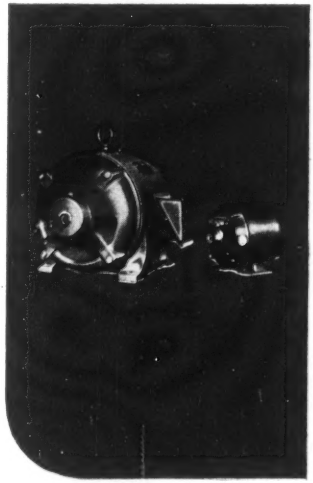
Century 125 H.P. motors driving ammonia compressors for ice for the Falcon Dam, which is under construction on the Rio Grande River.



Century 125 H.P. motors on circulating pumps for condensing units. They serve the refrigeration system of a large department store.



Century 125 H.P. motors on circulating pumps for chilled water. Used in the same department store.



Here are some typical examples of equipment powered by large Century motors, which were application engineered for TOP PERFORMANCE.

Matching the operating characteristics of your equipment is made easy through Century's wide line of single phase, polyphase and direct current motors to choose from. They are made in many types, ranging in size from 1/8 to 400 horsepower, with literally hundreds of specifications adaptable to specific applications.

Get Top Performance of your equipment through skillful motor application by specifying Century motors on the equipment you buy and for replacement.

CENTURY ELECTRIC CO.
1806 Pine St., St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

how do you want your HOT WATER?

INTERMITTENTLY?

Store up hot water for *intermittent* needs in a **p-k** copper lined storage heater. Supply of hot water is assured, even from a minimum steam supply.

The tank is completely lined with copper which keeps hot water pure and rust-free until needed. In fact, some of these **p-k** copper lined storage heaters are still turning out clear, clean hot water after more than 40 *years* of low-cost service.

Check your own hot water needs—then check in with **p-k** for the most satisfactory, most efficient equipment to provide long-life service.

CONTINUOUSLY?

For every industrial process or commercial demand there's a **p-k** instantaneous hot water heater available. **p-k** heaters assure continuous hot water supply, to any needed capacity.

In **p-k** instantaneous heaters, temperature and expansion stresses have been eliminated—an assurance of dependable, safe operation. Plus the fact that **p-k** simplified construction permits easy, economical inspection and maintenance. Check your needs now with **p-k** for the right answer.

Closed Type Reclaimers • Condensate Coolers • Flexitube Reclaimers • Hot Water Storage Heaters (Vertical and Horizontal Types) • Instantaneous Hot Water Heaters • Open Pit Type Reclaimers

Copper Silicon Hot Water Storage Heaters

Cement Lined Hot Water Storage Heaters • Clad Steel Hot Water Storage Heaters

the **P-K** Patterson-Kelley Co., Inc.

970 Burson Street East Stroudsburg, Pa.

1700

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

Here's the ECONOMICAL Way to KEEP AIR FRESH In Factories, Hospitals, Department Stores, Hotels

Sensational NEW AIREACTOR*

GYROSTATIC EVAPORATOR SPACE DEODORIZER

*Formerly Famous As "Renovair"

Works on Thrifty, Efficient Vapor Principle!

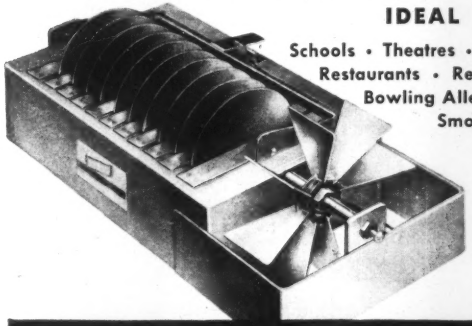
No Wicks! No Pumps! No Motors! No Mechanical Operating Costs!

Ordinary mechanical deodorizers can be costly to install, costly to operate and costly to maintain. Not so with Aireactor Gyrostatic Evaporator! This amazing new kind of space deodorizer fits quickly and easily *inside* any mechanical ventilator, adiabatic cooler or home winter air conditioner. And, once installed, it can practically be forgotten! For its power is derived from the air stream of the conditioning unit, itself. Thus, there's no motor to clog or burn out . . . nothing to repair or replace. Costs nothing whatever to run!

AIREACTOR KILLS HARSHEST ODORS WITHOUT PERFUME. Gyrostatic Evaporator releases vapors that neutralize indoor odors much the same as masses of green foliage freshen air outdoors. So effective, Aireactor ends even harsh paint and smoke smells. Yet there's no obnoxious "perfumey" odor of its own. No *formaldehyde.* Will not burn, will not harm the sense of smell.

INCREASES COMFORT AND PRODUCTION. Clean, pleasant air from Aireactor attracts customers into stores, restaurants and recreation centers. And, in factories and other business buildings, it helps keep employees both happy and efficient. *Can actually pay for itself in increased production!*

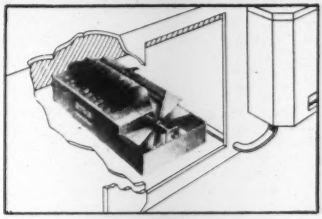
Flexible, too! Aireactor performs perfectly from spray guns, fogging machines or from 12-ounce wick bottle for limited spaces. To end your air conditioning headaches . . . write for further information about amazing Aireactor and the economical Gyrostatic Evaporator today!



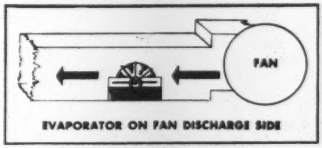
IDEAL FOR:

Schools • Theatres • Offices • Washrooms
Restaurants • Retail Stores • Hospitals
Bowling Alleys • Industrial Plants
Smoke Odor Counteraction
Hotels & Apartments

Boyle-Midway Inc., Correctair Division
22 E. 40th St., New York 16, N. Y.
Cranford, N. J., Chamblee, Ga., Chicago, Los Angeles, Toronto

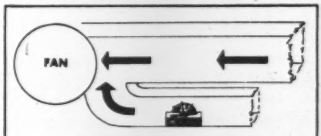


EASY TO INSTALL!
Aireactor Gyrostatic Evaporator fits *inside* the air conditioning duct. Quick, simple to place in position. No special tools or equipment required.



EVAPORATOR ON FAN DISCHARGE SIDE

NOTHING TO CLOG!
Power is supplied by air stream. No intricate parts to clog up. (Above illustration shows how to install on discharge side of fan.)



EVAPORATOR ON FAN INTAKE SIDE

NOTHING TO BURN OUT!
No motor of its own to get out of order. No drain on electricity or other fuel. Cost-free and simple in operation as a windmill. (Above illustration shows how to install on fan intake side.)

SEND FOR FREE FOLDER

Boyle-Midway Inc., Correctair Division
22 E. 40th St., New York 16, N. Y.

Please send me AIREACTOR Information Folder *at once!* I'm interested in full details.

Name.....
Firm.....
Address.....
City.....Zone.....State.....

MORE POWER for your dollar!

15 different Circulators

TWO TYPES • HORIZONTAL OR VERTICAL

EACH **DESIGNED** FOR ITS RATED CAPACITY

LARGER MOTORS • HEAVIER CONSTRUCTION

COMPARE capacities and motor horse power as well as size when you choose Circulators and you'll choose Thrush. Here is a complete line of horizontal or vertical Water Circulators to fit every heating job. They offer more for your circulator dollar because they're built better . . . even the smallest sizes are rugged in construction and have larger motors with greater actual output than other makes of equal rating. That means less trouble on the job . . . fewer service calls and greater customer satisfaction. Patented coupling eliminates vibration. Lubrication is sealed in. Ask your wholesaler about them or write Dept. E-7.

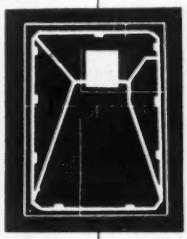
H. A. THRUSH & COMPANY • PERU, INDIANA

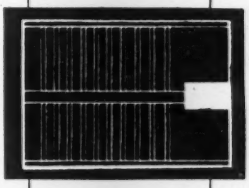
¾" • 1" • 1¼" • 1½"
1/6 HORSEPOWER

2" • 2½" • 3"
1/4 HORSEPOWER

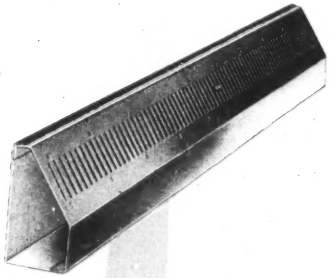
THRUSH water circulators

Which system shall I use?





Standard's perimeter baseboard registers work with them all!



for loop, lateral, crawl-duct, and all other systems, they're best!

Standard's Perimeter Baseboard Registers, illustrated model C-F5, feature all the latest developments of perimeter heating and are the finest, most efficient registers on the market today. Each four-foot section has its own individually operated damper control, easily adjustable for minimum, medium, and maximum volume control. Standard's Perimeter Baseboard Registers spread warm air along the baseboards and do away with concentrated heat drafts that fade to cold spots in room interiors.

features:

- Each section controlled individually.
- Efficient Snap-on end caps.
- Heavy-duty construction of 20-gauge steel.
- Finished in prime coat . . . special finishes on request.
- Simplifies balancing of heating system.
- Comes in 4-foot sections with separate butt straps for continuous installation.
- Set*LOK feature for positive air control available at slight extra cost.

Ideal for use in homes, schools, churches, and commercial installations. Also available as C-F4. Both designs have sliding damper control. Adaptable for year-round air conditioning.

Standard Stamping & Perforating Co.

3135 W. 49th Place Chicago 32, Illinois

For more information, and a copy of Standard's New Pocket Catalogue, showing complete line of registers and grilles, *Mail Coupon Today.*

Standard Stamping and Perforating Co.
3135 West 49th Place, Chicago 32, Illinois

Gentlemen: Please send me more information about Standard's Perimeter Baseboard Registers and a copy of your Pocket Catalogue, at no obligation to me:

Name _____

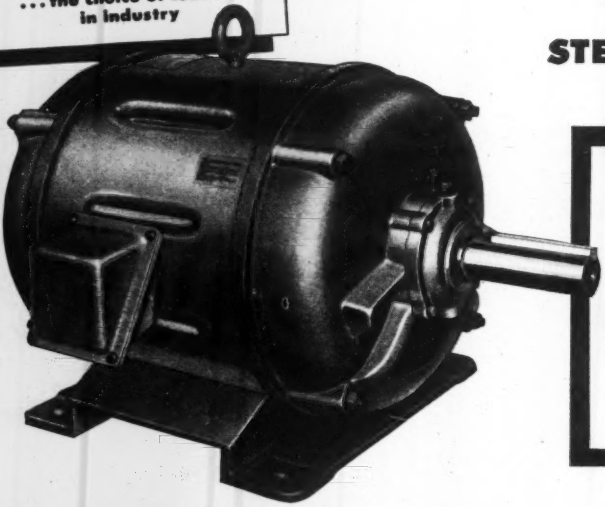
Firm _____

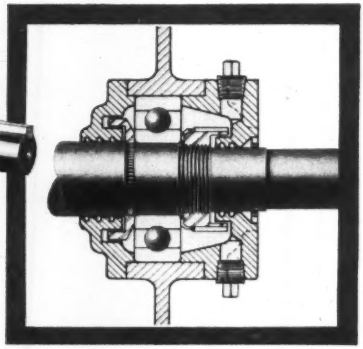
Address _____

City _____ ***State*** _____

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

Wagner
STEEL FRAME MOTORS





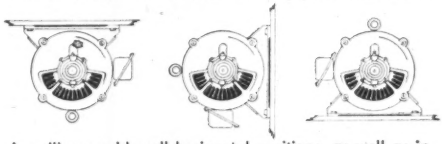
This sealed-bearing motor can be lubricated

Wagner Steel-Frame general purpose polyphase motors are equipped with labyrinth sealed bearing housings that effectively prevent the entrance of any dirt or grit that might cause premature wear. It is not necessary to lubricate the bearings—motors in the smaller frame sizes operate for years without relubrication. But... these Wagner Motors are provided with two lubrication openings — you *can* lubricate your motors when necessary or desirable, to add years of useful motor life in unusually severe applications.

Wagner's Bulletin MU-131 gives valuable information concerning proper lubrication of electric motors — Copies will be sent you on request.

DRIP-PROOF...3 WAYS

These open-type motors (in frames 326 and smaller) are completely drip-proof in any horizontal position because there are no openings in the frame and the end-plates can be rotated 90° or 180° for drip-proof installation



in ceiling or sidewall horizontal positions, as well as in the normal horizontal position.

Wagner Steel-Frame Motors are available in electrical types to meet most industrial requirements. Bulletin MU-185 gives full information—write for your copy.

WAGNER ELECTRIC CORPORATION
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

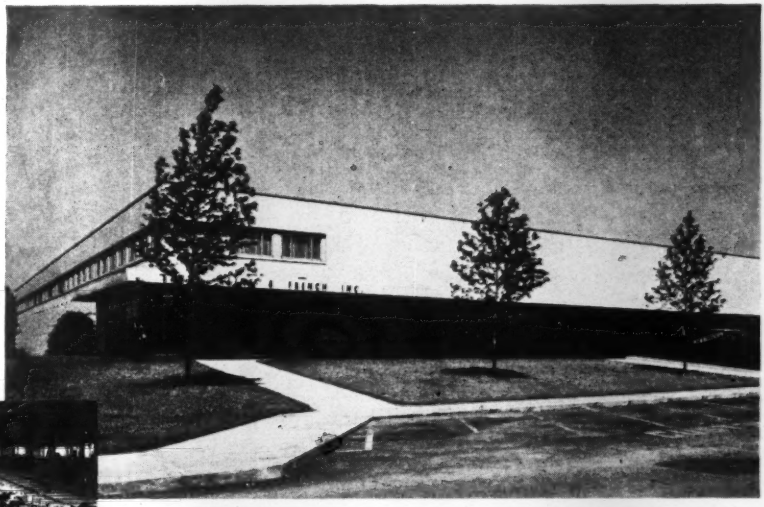
Wagner Electric Corporation
EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

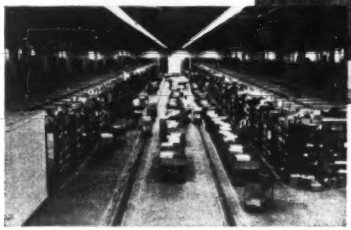
M52-17

YORK *Unitary* AIR CONDITIONING gives you greater freedom in design and space



In the new block-long offices of Smith, Kline & French, Inc. (leading wholesale druggists), York Unitary Air Conditioning provides offices with individual control of cooling and heating.

Another York-Sized Job—the warehouse of Smith, Kline & French, Inc.—a single, block-long room—is believed to be the world's largest fully air-conditioned commercial room.



Whether you're renovating an already existing structure or building a new one, York Unitary Air Conditioning saves you space and helps simplify your design problems.

For example, you can locate outside air intakes anywhere from windowsill to floor level. Only three pipes—water supply and return, and drain—are necessary. In the engine room, only space for a central water supply system is required. And there's no additional air handling equipment with the York Unitary System.

Your client will enjoy savings, too. Individual room controls allow management to condition only those spaces actually occupied. And cleaning and redecorating costs go down because all air—recirculated as well as outside—is filtered.

York Unitary Air Conditioners may be installed to provide heating initially and cooling added later. Right or left-hand units are available to facilitate piping.

Your nearby York Representative (listed in your Classified Directory) can add fact after fact to those above—facts that will surely demonstrate the superiority of York's Unitary System. Consult him today or write York Corporation, York, Pennsylvania.

THE BIG ADVANCES COME FROM

YORK

York refrigeration air conditioning

HEADQUARTERS FOR MECHANICAL COOLING...SINCE 1885

Need tools or machinery?

"One call gets them all!"

● It's faster and more convenient to use U.S. Steel Supply's "one call" service when you want tools and machinery for your plant maintenance or production needs. We have available a wide variety of top quality equipment that will meet your most exacting requirements. One call to your nearest U.S. Steel Supply office will bring quick delivery of most items in our diversified stock. One call gets them all!

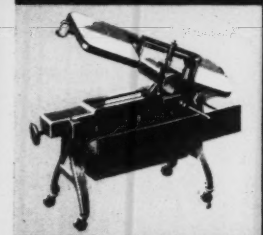
WRITE FOR FREE BOOK! You'll find plenty of helpful information in *Your Complete Guide to Metal Working Machinery and Industrial Tools.*

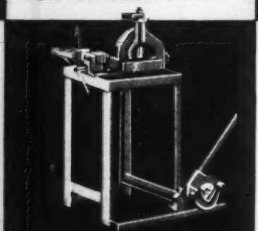
Beading Machines
Benders, Bar and Angle
Brakes, Hand or Power
"C" Clamps
Crimpers
Drill, Portable Electric
Elbow Machines
Expanded Metal
Flanging Machines
Galv-Weld
Grinders, Portable Electric
Grinding Wheels
Hoists, Hand or Electric
Lock Forming Machines
Marking Crayons
Notchers
Punches, Hand or Power
Punch Presses
Rolls, Slip, Hand or Power
Saws, Metal Cutting
Shears, All Types
Welding Electrodes
Welding Machines

CLAMPS

PORTABLE ELECTRIC SHEAR

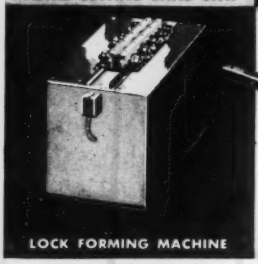
GRINDING WHEELS


METAL CUTTING BAND SAW

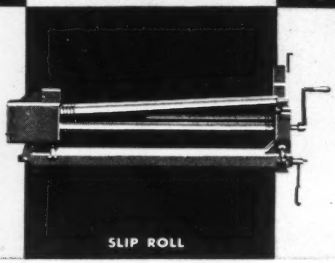

ANGLE SHEAR, NOTCHER AND BENDER

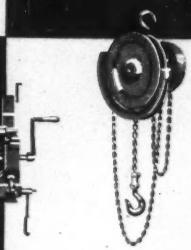
WELDING MACHINES

HAND PUNCHES


LOCK FORMING MACHINE

HAND BENDERS


SLIP ROLL


HAND HOIST

UNITED STATES STEEL SUPPLY DIVISION

UNITED STATES STEEL COMPANY

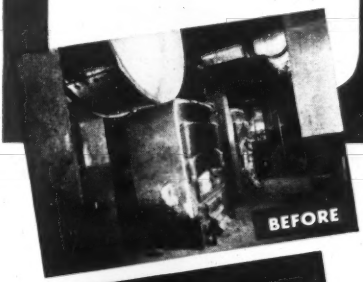
HEADQUARTERS: 208 So. LA SALLE ST., CHICAGO 4, ILL. WAREHOUSES COAST-TO-COAST

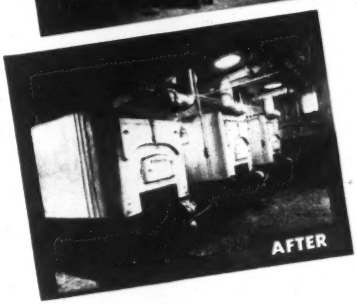
Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. NEWARK · PITTSBURGH · PORTLAND, ORE. · ST. LOUIS · TWIN CITY (ST. PAUL) · SAN FRANCISCO · SEATTLE

Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · PHOENIX · ROCKFORD, ILL. · SALT LAKE CITY · SOUTH BEND · TOLEDO TULSA · YOUNGSTOWN

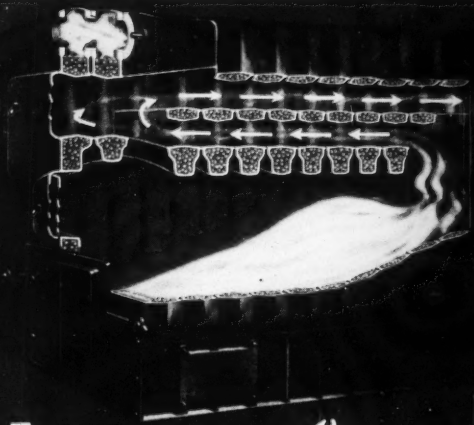
UNITED STATES STEEL

Scientifically Correct Combustion Chamber allows complete, efficient combustion in . . .





THREE WATER TUBE BOILERS are installed in this office building modernization job. In cold weather the battery takes care of the load, while one boiler handles the low or fluctuating demand for heat on mild days. Heating Contractor: John W. Danforth Co., Buffalo, N. Y.



AMERICAN-Standard

CAST IRON

WATER TUBE BOILERS

Installed singly or in battery, they meet the requirements of your larger jobs!

● Made of rugged cast iron, American-Standard oil or stoker fired Water Tube boilers provide dependable, automatic hot water or steam heat for larger homes and buildings.

Scientifically designed combustion chamber built with arched crown sheet, provides complete combustion of oil or coal. Water backed vertical tubes assure rapid water circulation and provide an unusually large amount of heat-absorbing surface. Long double flue gallery makes hot gases travel twice the length of the boiler, thus assuring maximum heat transfer.

Water Tube boilers are easy to assemble and install. Shipped in sections that can be moved by hand and in sizes small enough to be carried through a door or elevator hatch, they are ideal for modernization jobs as well as for new construction.

American-Standard Water Tube boilers and other heating equipment are sold through selected wholesale distributors to heating and plumbing contractors.

American Radiator & Standard Sanitary Corporation,
P. O. Box 1226, Pittsburgh 30, Pa.

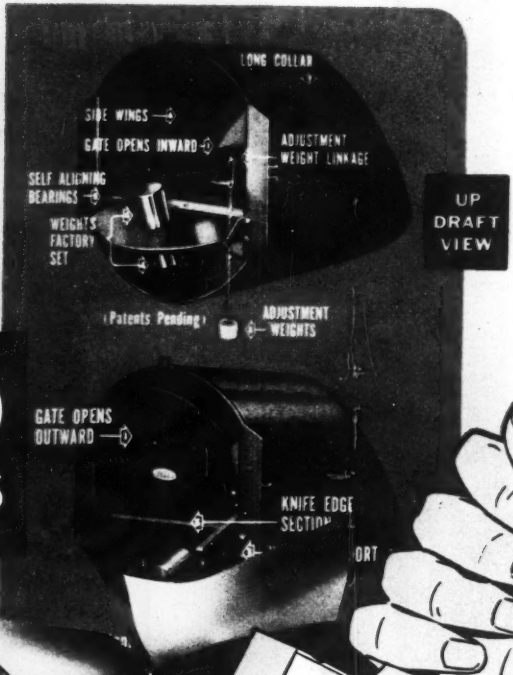
AMERICAN-Standard

HEATING

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Now ... a *field* BAROMETRIC DRAFT CONTROL FOR COMMERCIAL & INDUSTRIAL



GAS FIRED HEATING PLANTS

(Not yet available in domestic sizes)

The Field "M-G" Double Acting Draft Control brings greater efficiency, greater economy to gas fired heating plants through extremely accurate control of drafts. The double-acting gate opens inward to regulate up-drafts, and outward to relieve internal or down-draft pressures as small as a [illegible] of an inch. This newest Field Draft Control [illegible] heating plants the same accuracy, sensitivity [illegible] have made Field Draft Controls first in [illegible] Write today for detailed specifications.

FIELD CONTROL
of H. D. Conkey & Company, ME[illegible]

SEE OUR DISP[illegible]
OIL HEAT INSTITUTE COD[illegible]

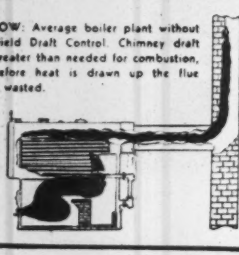
In case of prolonged [illegible] tional auxiliary [illegible] and wired to shut off [illegible] against the escape of

OK'd by America's Leading Gas Companies

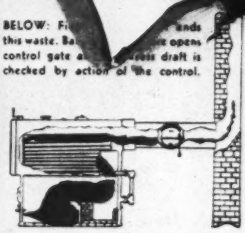
and many City Safety Inspectors

Why a Field Draft[illegible]

BELOW: Average boiler plant without a Field Draft Control. Chimney draft is greater than needed for combustion, therefore heat is drawn up the flue and wasted.

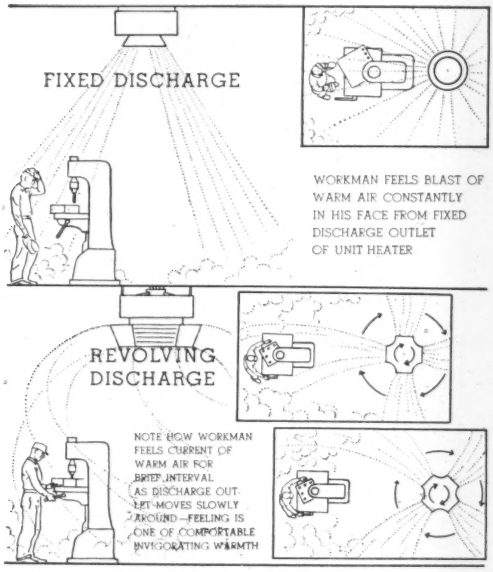


BELOW: Fi[illegible] ends this waste. Ba[illegible] opens control gate a[illegible] draft is checked by action of the control.



CONTROLLED DRAFT BY *field* BAROMETRIC CONTROLS

What is the BIG difference between revolving and fixed unit heater discharge outlets? . . . .


FIXED DISCHARGE
WORKMAN FEELS BLAST OF WARM AIR CONSTANTLY IN HIS FACE FROM FIXED DISCHARGE OUTLET OF UNIT HEATER
REVOLVING DISCHARGE
NOTE HOW WORKMAN FEELS CURRENT OF WARM AIR FOR BRIEF INTERVAL AS DISCHARGE OUTLET MOVES SLOWLY AROUND—FEELING IS ONE OF COMFORTABLE INVIGORATING WARMTH

WING REVOLVING UNIT HEATERS are successfully solving the heating problems of thousands of industrial plants today because they assure a uniform, comfortable temperature throughout, with no hot blasts, no cold spots, no chilly corners. Instead of annoying hot blasts, the worker is conscious only of a pleasing sensation of fresh, live, invigorating warmth.

And in Summer, with the steam off and fans on, these revolving "heaters" are equally effective for cooling your plant.

L. J. Wing Mfg. Co.
140 Vreeland Mills Road, Linden, N. J.
In Europe: Etab. WANSON, Haren-Nord, Brussels, Belgium
Factories: Linden, N. J. and Montreal, Canada

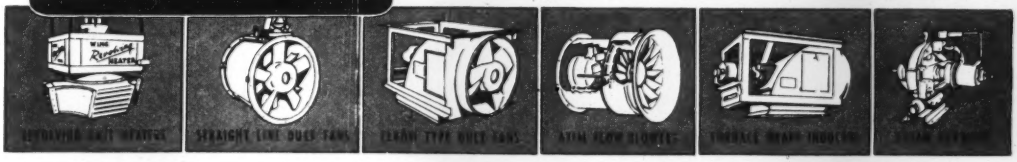
Wing
REVOLVING UNIT HEATERS

Write for a copy of Wing Bulletin HR-6, which discusses in detail the problems of industrial plant heating and in particular the value of revolving discharge.

L. J. Wing Mfg. Co.
140 Vreeland Mills Road, Linden, N. J.

Please send me a copy of your Bulletin HR-6. Wing Revolving Unit Heaters.

Name .....
Firm .....
Address .....
City ..... Zone ..... State .....



FROM OUR FILE OF HEAT INSULATION JOBS

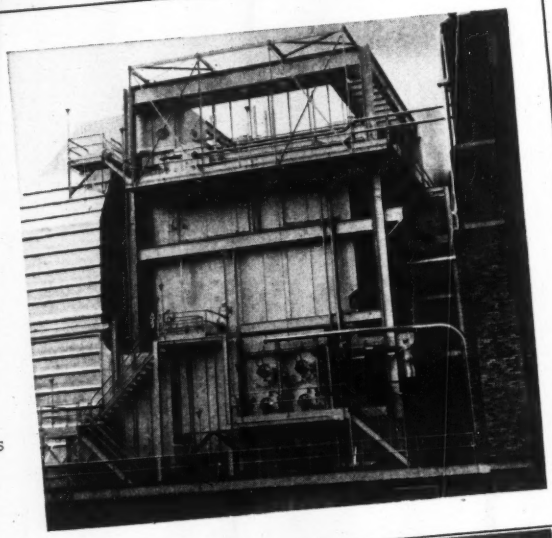
CONTRACT # 14839

COMPANY:
Public Service Company,
Weleetka Power Station,
Weleetka, Oklahoma.

INSTALLATION:
Babcock & Wilcox water wall boiler — gas, oil, or coal-fired — steam output=330,000 lbs./hr.

OPERATING TEMPERATURE:
835° F. — steam pressure 700 lbs.

REMARKS:
Outdoor location requires efficient insulation. Insulation on breeching must be weatherproofed.



Outdoor boiler suspended in air cuts installation costs

By suspending this boiler in air, the Public Service Company of Oklahoma, greatly reduced the cost of foundation footings, saved appreciably on construction costs. The suspension method also relieved the problems caused by expansion and contraction of boiler sidewalls.

This photo shows part of the supporting steelwork, as well as the breeching (left), and the spring loaded hangers that carry the main steam header.

To boost efficiency and cut operating costs, all major elements of this outdoor boiler were insulated by Armstrong's contracting organization. A 2" layer of Hy-Temp block was used on the boiler front wall, while the furnace front wall was insulated with 4" of Hy-Temp block. Insulation of both walls is covered with a metal casing bolted to the boiler proper. The breeching was insulated with 2½" of 85% Magnesia block and weatherproofed with Armstrong's Insulmastic.

When you contract with Armstrong for heat insulation work, sound engineering, quality materials, and skilled application assure you of a thoroughly professional job. The next time you're in the market for insulation, why not get in touch with this dependable organization. Just call the Armstrong office nearest you or write directly to Armstrong Cork Company, 4407 Maple Avenue, Lancaster, Pennsylvania.

Complete Insulation Contract Service

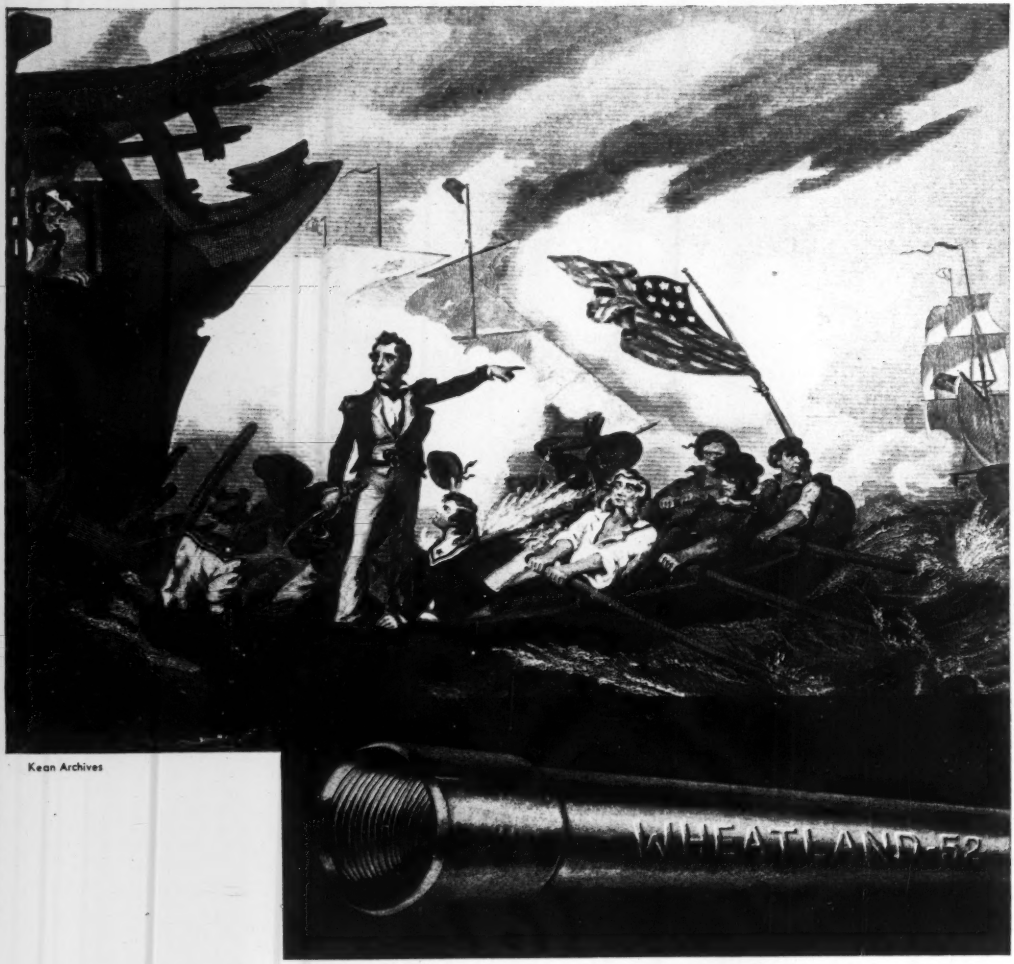
A satisfactory insulation contract is more than a bid on a set of specifications. There are other factors that cannot be written into a proposal but which can largely determine whether or not the agreement will be entirely satisfactory. They include:

1. Financial responsibility — resources to complete the contract despite any unforeseen events.
2. Integrity—a reputation for quality work and for prompt settlement of any justified complaints.
3. Technical ability — experience, plus technical and research staff to complete the work in accordance with best practices.
4. Manpower resources — trained supervisors and workmen able to handle any contract efficiently.
5. Efficiency—ability to handle accurately things like accounting, tax provisions, insurance, and workmen's compensation.

You get all these with an Armstrong Contract

ARMSTRONG'S INDUSTRIAL INSULATIONS

Your welders will seem like
Siamese Twins
When they use Midwest Welding Fittings, your welders will turn out so much more work that they'll seem like Siamese Twins. The reason? . . . The exceptional accuracy and uniformity of Midwest Welding Fittings enable your welders to spend more time welding and less time in preparation.



Kean Archives

PIPE WITH THE YEARMARK

IMPORTANT DATES IN HISTORY

Famed in American history is the phrase, "Don't Give Up The Ship". These immortal words were spoken in 1813 by Commodore Perry. This date marks another important event in the growth of America.

The Wheatland Tube Company stands behind the date on each length of pipe produced in their mills. Constant testing for precision, for quality, for dependability, make this date an important one for you for it is your assurance of strength!

WHEATLAND STEEL PRODUCTS COMPANY

BANKERS SECURITIES BUILDING, PHILADELPHIA 7, PA.

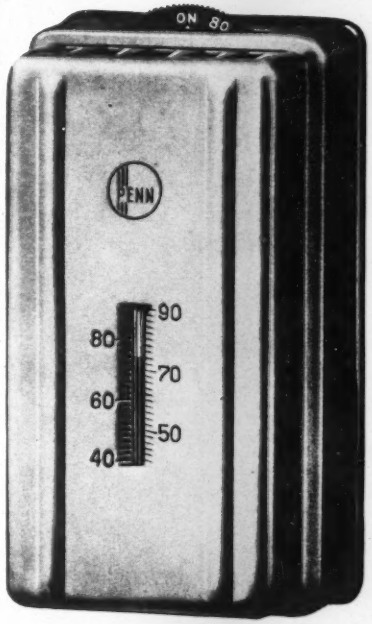
Scrap is urgently needed to help keep America strong and free. Do your part — *get in your scrap today!*

selective heating

summer ventilation

fuel economy

3 jobs with 1 UNIT HEATER CONTROL



First, you get selective heating to meet the particular requirements of various sections of a building. Once set, the operation is automatic. Then, heat anticipation holds temperature closely to the selected level for real heating comfort.

Second, during winter months the "ON-OFF" switch is a great fuel saver. A mere rotation of the dial to "OFF" position stops heat flow during idle periods . . . or to little-used areas . . . or to areas where heat can escape such as receiving or shipping rooms which may be exposed to outside temperatures for long periods.

Third, during the summer, this *same* switch permits manual control of unit heater fan for ventilation whenever desired. For continuous fan operation, you merely rotate the dial to "ON" position.

Yes . . . these 3 jobs are possible with *one* PENN Unit Heater Thermostat featuring heat-anticipation PLUS the built-in "ON-OFF" switch! Learn more about this *better control* for unit heaters. Ask your manufacturer, wholesaler or write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U. S. A. In Canada: Penn Controls Limited, Toronto, Ontario.

PENN

AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, PUMPS, AIR COMPRESSORS, ENGINES, GAS RANGES

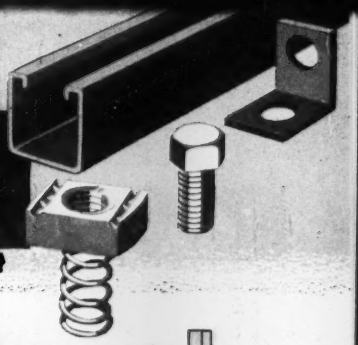
Whatever the job you're right with a DELCO!
Whether you need totally enclosed or open-end motors . . . fan cooled or explosion-resistant motors . . . you're certain to get the right motors on the job when you choose Delco.
Each and every Delco motor is designed and built for the job it has to do. It's made of the finest materials, and engineered to stand up longer under the roughest conditions.
So check up on Delco motors, now. You'll find Delco has the motors you need, and that Delco always meets its commitments. For full details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.
DELCO FEATURES MAKE DELCO FINEST
DELCO PRODUCTS
Division of General Motors Corporation
Dayton, Ohio
DELCO
DAYTON OHIO

typical UNISTRUT framing applications

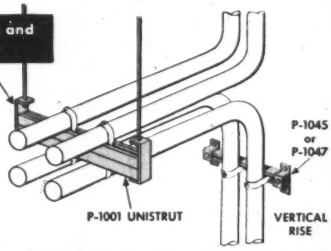
TO SUPPORT, SUSPEND AND MOUNT ALL KINDS OF MECHANICAL PIPING

No drilling, no welding, no special tools or equipment—adjustable UNISTRUT framing assures exact slope or pitch!

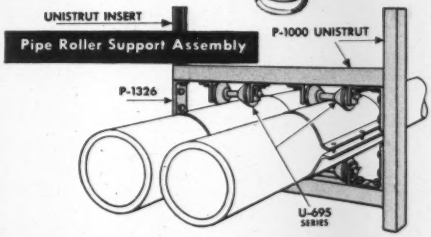
The UNISTRUT method conserves steel, reduces manpower hours, cuts overall costs.



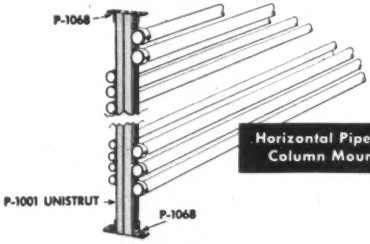
Trapeze Hanging and Vertical Rise



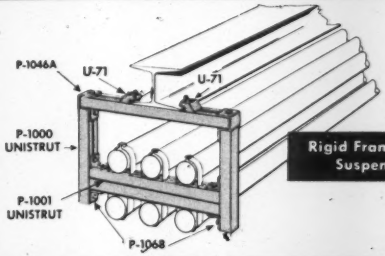
Pipe Roller Support Assembly



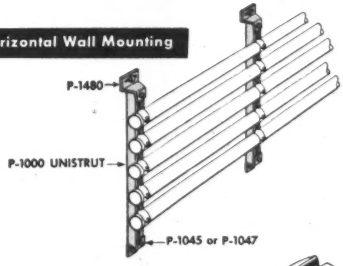
Horizontal Pipe Run, Column Mounted



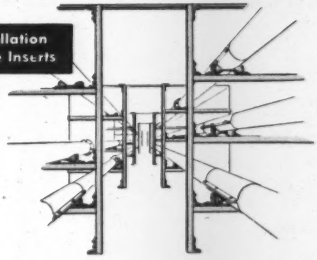
Rigid Frame Beam Suspension



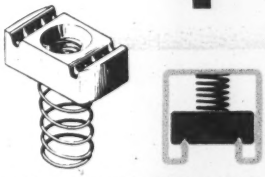
Horizontal Wall Mounting



Tunnel Installation with Concrete Inserts



Only UNISTRUT offers this Spring-Held Clamping Nut which ties together both sides of the slotted channel and forms a *Box Section* at points of connection for greater load strength.



Write today for your *FREE* Copy

of New 78-page Catalog No. 700! Includes above drawings and countless other examples of how to mount, rack, frame, suspend and support all kinds of mechanical and electrical equipment.

UNISTRUT Products are Bonderized

U. S. Patent Numbers
2327587 2329815
2345650 2363382
2380379 2405631
2541908
Other Patents Pending

For Defense Production—Every day the value of UNISTRUT products is being proved by their use in Defense Industries and Armed Services installations where flexibility, and assembly and erection speed count most.

The World's Most Flexible All-Purpose Metal Framing

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois, Dept. H7

Please send without obligation the items checked below:

☐ Catalog No. 700 ☐ UNISTRUT Sample

Name_____

Company_____

Address_____

City_____ Zone____ State____

"...costs more, AND WORTH IT!"

Grant Wilson

DUX-SULATION

(ASBESTOS-PROTECTED)

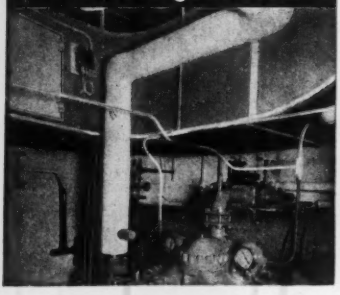
The initial cost of DUX-SULATION may be higher — but by the time a good job is completed you have the BEST Thermal/Acoustical Duct Insulation possible. It's worth more because:

1. **Comes complete with adhesive and tape — there are no extras to buy.**
2. **It permanently maintains its original specified thickness — even at the corners and joints.**
3. **Its application is fast, simple and secure. It is ideal for application on (inside or outside) round, rectangular or irregular shaped duct-work.**
4. **DUX-SULATION will not mat down, sift, crumble, powder or shift. It can be installed in the shop or on the job because it's stronger and tougher. It's non-irritating.**

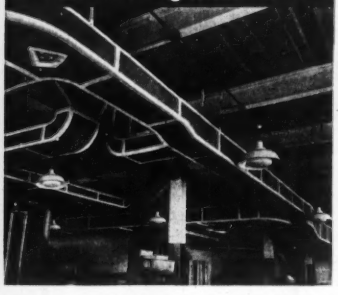
You will want to see and feel the superior construction of Asbestos-Protected DUX-SULATION. So write for a free sample today. Then you will know why it's worth more and why you can specify it with confidence.

Write to: ***GRANT WILSON INCORPORATED***
BOARD OF TRADE — SUITE 1560
CHICAGO 4, ILLINOIS

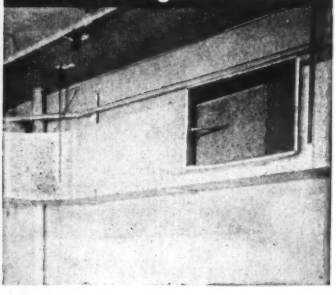
Insulates Against Cold

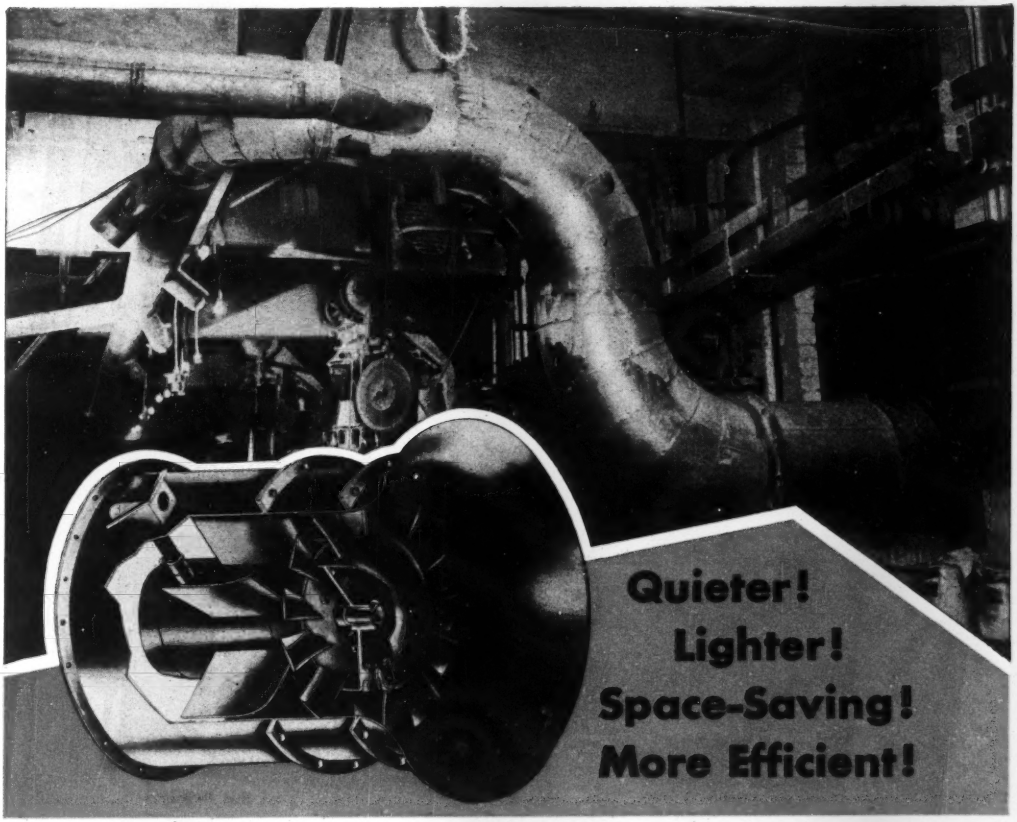


Insulates Against Heat



Insulates Against Sound





JOY AXIVANE* FANS

(SERIES 1000)

Write for Bulletin, or

Consult a Joy Engineer

The quieter operation, lighter, more compact design, lower power consumption and unmatched efficiency of JOY Axivane Fans are *real* advantages! What's more, their vaneaxial design and in-line construction permit mounting right in the air duct, making installation simple and saving greatly on time and cost. These features, plus the extreme flexibility of operating range made possible by adjustable blades—a standard feature of all JOY Fans—mean better, more dependable and lower-cost ventilation, no matter what your conditions are.

● Let JOY Axivane Fan specialists work with you for best results on your ventilation jobs.

*Reg. U. S. Pat. Off.

W&D 12355

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

An Outstanding Record of Acceptance!

LESLIE Floatless Level Control installation on five 85-90000 kw generators, maintaining the hotwell level ± 1" by controlling 6" valve in condensate pump discharge — in service 12 months — led to 16 more installations for same company.

The above is typical of the fast growing acceptance of this rugged and accurate level control.

ADVANTAGES

- EASY TO INSTALL
- ACCURATE REGULATION (± 1" Water Column)
- NO FLOATS, STUFFING BOXES, ETC.
- MULTI-MEDIUM ACTUATED
- DIAPHRAGM PRESSURE ELEMENT
- ACTION REVERSIBLE

Applications: On open and pressurized vessels, including boilers, tanks, evaporators, heaters, standpipes, etc.

PRINTED IN U.S.A.

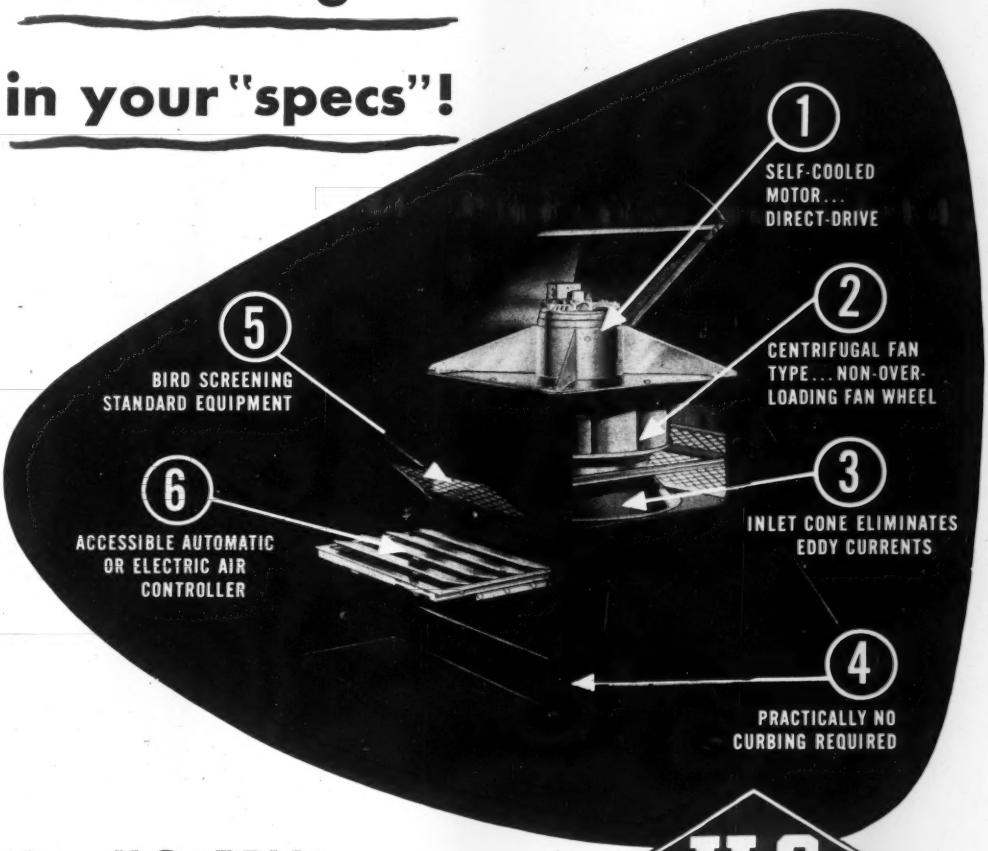
SEND for illustrated Bulletin

Look for LESLIE Regulators under "Valves" or "Regulators" in your Classified Telephone Directory in leading industrial cities where LESLIE factory-trained engineers are located.

LESLIE CO., 237 Grant Avenue, Lyndhurst, New Jersey 1827

PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS • FLOATLESS LEVEL CONTROLS
PUMP GOVERNORS • TEMPERATURE REGULATORS
SELF CLEANING STRAINERS • AIR HORNS • STEAM WHISTLES

Get the "Big 6" in your "specs"!



ILG
REG. U. S. PAT. OFF.

New ILG "PRV" power roof ventilators

1. **SELF-COOLED MOTOR**—pressure ventilated with clean, cool, outside air—reduces solar heat load—cooler operation results in longer life, lower maintenance. Direct-drive—no belts, no pulleys to waste power and increase maintenance costs.
2. **CENTRIFUGAL FAN TYPE**—with backward curved blades. No possibility of motor overload at any capacity over complete range of pressure delivery.
3. **INLET CONE**—specially designed to equalize inlet velocities and eliminate eddy currents, thus contributing to quiet operation and improved operating efficiency.
4. **PRACTICALLY NO CURBING**—self-contained base assembly eliminates extra cost of expensive high curbing commonly required—also cost of installing air control accessories on the job.
5. **BIRD SCREENING** is furnished as standard equipment on ILG "PRV" Power Roof Ventilators. No "extra" charges to throw your costs out of line!
6. **ACCESSIBLE AIR CONTROLLERS**—gravity or motor operated shutter, or manually or motor operated air controller slides out on tracks for easy adjustment or servicing.

These are only six of dozens of new features. Get the complete story from our nearby Branch Office (consult classified directory) or send coupon today.

VENTILATION

Free! New engineering data bulletin No. 1901 gives you the complete story—features, sizes, capacities, dimensions. Send coupon now!

☐ Send free bulletin No. 1901

*Firm Name*_____

*Individual*_____ *Title*_____

*Address*_____

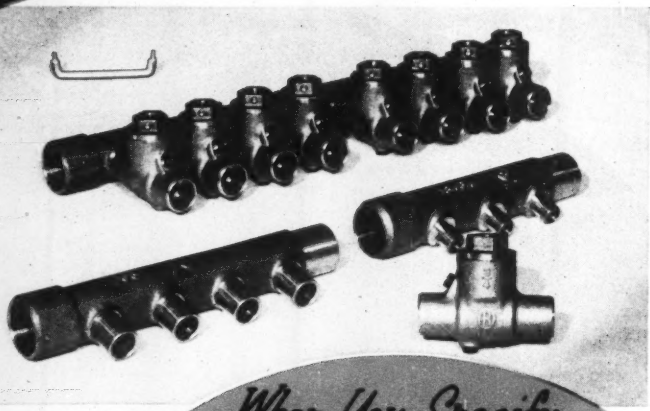
*City*_____ *State*_____

Balancing is easier ...

AND COSTS LESS

Equatemps can be furnished for ⅜, ½, and ¾-inch tubing and for 1-inch threaded pipe ends.

Build a header the modern way with Equatemp Manifold units and Equatemp solder-type valves. Available with 3 or 4 outlets, manifolds may be slipped together to form headers of any desired length. Valves and manifolds sold separately.



When You Specify

EQUA = TEMP

RADIANT HEAT VALVES

Save the cost of extra valves and extra fittings by specifying O-B Equatemps on your next radiant job. These versatile new valves do the whole job—balancing, venting, and draining. Best of all, Equatemps can be shut off leaktight on individual lines. A well drilled in the valve stem, permits flow to be balanced by thermometer method. Once proper balancing has been achieved, settings can be locked to prevent tampering by the "home plumber."

For additional information about Equatemps, contact your local O-B valve distributor or send in coupon below requesting illustrated folder.

EASY TO REGULATE - EASY TO INSTALL

Equatemps are ideal for all types of hot water radiant heating systems—floors, ceilings, panels, convectors, or baseboard systems.

Try them in—

- **Homes**
- **Apartments**
- **Hotels**
- **Hatcheries and Farm Buildings**
- **Motor Courts**
- **Snow Melting**

Please send me Equatemp folder 1214-V

Name .....

Company .....

Street .....

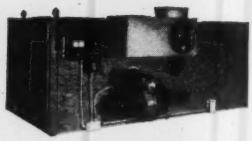
City ..... State .....

Ohio Brass

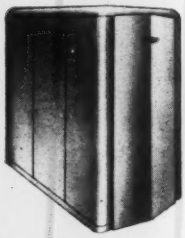
MANSFIELD • OHIO

4209-V

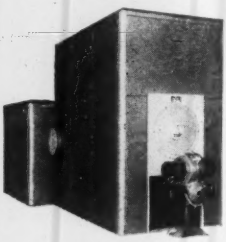
The ORIGINAL...
HOT WATER CONTROL
with LIQUID-FILLED
Hydraulic-Action ELEMENTS
These Hydraulic-Action Controls by White-Rodgers provide exceptionally quick response to changes of water temperature. Positive in setting, free from temperature drift and easy to install, they provide unusually close control with narrow temperature differentials.
Available in surface, well-immersion (vertical or angle), super-fast direct-immersion and remote bulb types.
For applications requiring relays, try a White-Rodgers Relay with built-in transformer, available in a wide variety of contact actions. Write for complete catalog.
WHITE-RODGERS
Controls
FOR REFRIGERATION
HEATING AND
AIR CONDITIONING



SUSPENSION SERIES



POWERAIRE SERIES



POWERATED SERIES

3 reasons why

Jackson & Church furnaces meet most warm air heating needs!

J-C Suspension, Poweraire and industrial PoweRated furnaces . . . the "BIG 3" in the warm air heating field.

From hatcheries to factories . . . from houses to hangers . . . there's a Jackson & Church furnace to meet every specific heating requirement.

1. **SUSPENSION FURNACES** . . . for overhead installation when space is at a premium. Btu output from 112,000 to 450,000
2. **POWERAIRE FURNACES** . . . for residential, commercial and light industrial requirements. Btu output from 152,000 to 320,000
3. **POWERATED FURNACES** . . . job-specified to meet the individual requirements of industrial heating. Btu output from 380,000 to 3,800,000

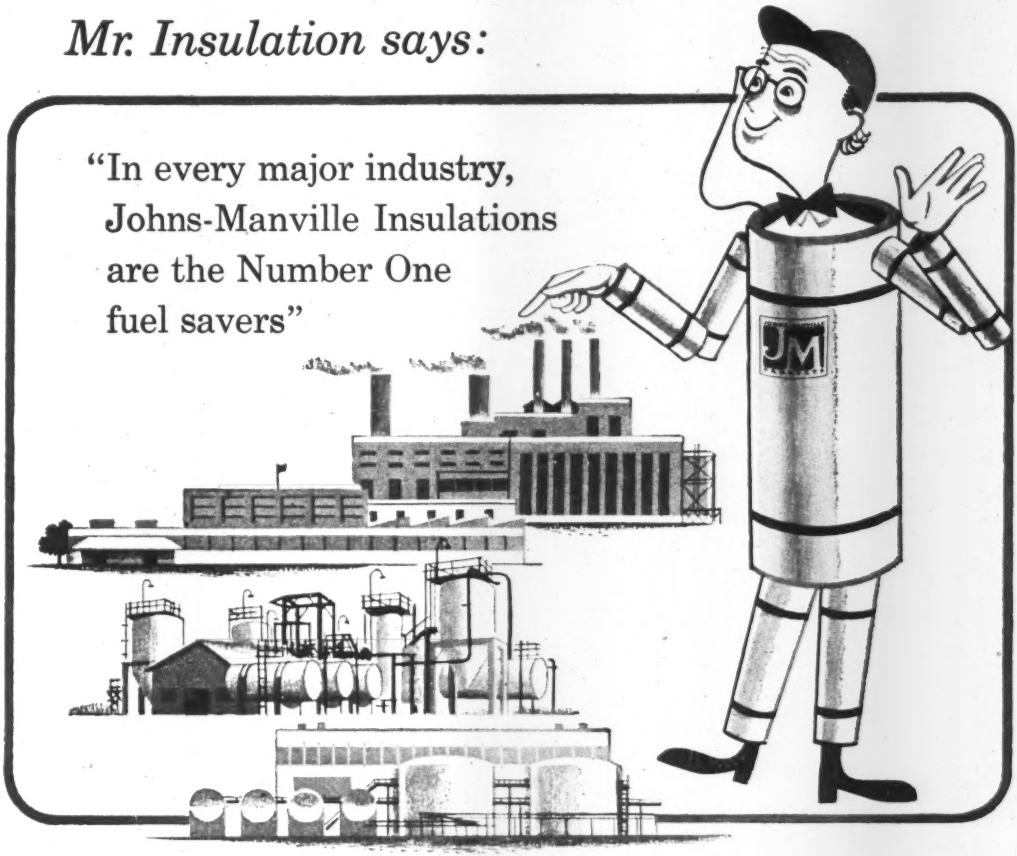
Our Engineering Department is at your service to assist with heating plans and problems. See your local J-C dealer or write directly to us.

. . . America's Largest and Most Complete Warm Air Heating Line . . .

J-C **JACKSON & CHURCH COMPANY, SAGINAW, MICHIGAN**

WORK WELL DONE SINCE '81

Mr. Insulation says:



IN PLANTS with stacks or stills, tanks or towers, the story is the same—"Insulation by Johns-Manville" means the maximum return on your investment. There are two good reasons for this:

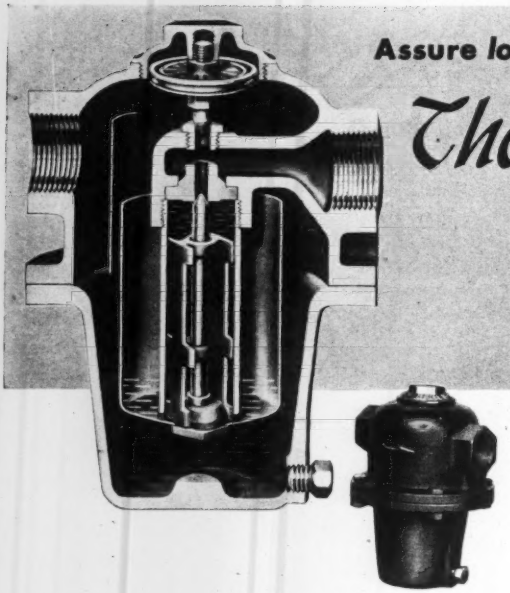
1. YOU GET THE RIGHT *MATERIALS*—From asbestos and other selected raw materials, Johns-Manville manufactures a wide range of industrial insulations for service from 400F below zero to 3000F above. If you need engineering advice in determining exactly the right one for your job, you can get experienced and authoritative assistance from your local Johns-Manville insulation engineer.

2. YOU GET THE RIGHT *APPLICATION*—Even correctly selected insulation needs proper application to permit it to serve at peak efficiency through the years. Here you can always count on J-M Insulation Contractors and their highly skilled mechanics. These organizations are trained in Johns-Manville application methods, and have generations of insulation experience behind them.

Why not get the complete picture? Call on insulation headquarters when your next job is in the planning stage. Just write Johns-Manville, Box 60, New York 16, N. Y.

Johns-Manville *first in* **INSULATIONS**

ILLINOIS
Float & Thermostatic TRAPS



Assure *lower* return line temperatures

They're different!

–in construction

–in performance

ILLINOIS Float & Thermostatic Traps operate under vacuum with the same high efficiency as under pressure. No more water-logging of mains . . . no more air binding . . . end "morning overload" troubles. The instantaneous action of the condensate valve assures complete drainage of condensate. A separate thermostatically controlled valve vents air continuously in large volume, yet positively prevents loss of steam.

Recommended Applications

Low Pressure Heating Systems, Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Large Radiators or Pipe Coils, Hot Water Generators, Drips of Mains and Risers. Draining Coffee Urns, Warming Tables, Pasteurizers, Vacuum Pans, Heat Exchangers, Process Heaters, Sterilizers, Autoclaves, Cooking Kettles, Kilns and similar equipment.

(For operating ranges from 25 inches vacuum to 15 pounds pressure use Series G Traps. For pressures up to 50 pounds use Series MG.)

Rated capacities of various size traps from 200 pounds to 5000 pounds condensate per hour, at 2 pounds differential across the trap.

Positive, Instantaneous Valve Action . . . an Exclusive Feature

The Snap Action of the Condensate Control Valve assures efficient trap operation. The valve is not directly attached to float but is actuated by impact of the dropping float. Valve action is instantaneous whether the trap is handling its maximum capacity or only a trickle of condensate and regardless of variation in pressures. The valve is either wide open or tight shut—never cracked on seat, never hanging in an intermediate position. It is water-sealed at all times. It cannot chatter and is never affected by pulsations in the flow of condensate to the trap.

Simple, Compact, Trouble-proof

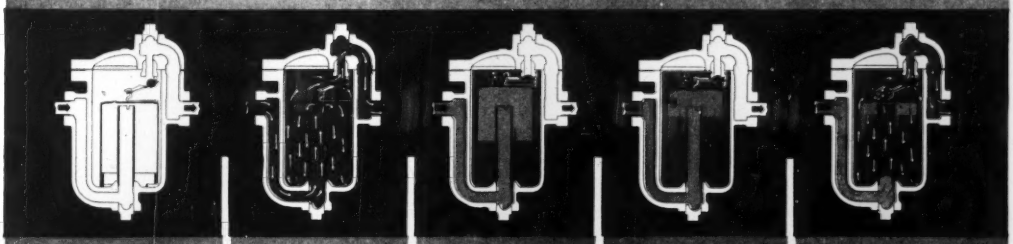
No ball floats to puncture or collapse—no toggles, pins, levers or hinges to corrode, stick or bend. Hard, stainless alloy steel renewable valves and seats are used for both condensate and air bypass units. Both valve units are at the top of trap out of dirt and sludge, assuring long life and satisfactory operation without attention. Straight through connections save head room, fittings, trenching, labor, and avoid low hung piping or lifts. Trap is easily opened for inspection without disturbing piping.

TRAP NOT DAMAGED BY FREEZING. Freezing will not harm this trap in any way and it is self-thawing.

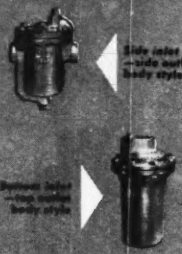
Write for Bulletin 34-C

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8

ARMSTRONG TRAPS are Designed to give Outstanding Performance



1. When trap is installed, inverted bucket is down and valve is wide open.



2. When steam is turned on, condensate (solid color) flows into trap and out orifice, until . . .

SELF-SCRUBBING ACTION (See Fig. 2 above). Note that condensate first flows down between bottom of bucket and trap body, then up and out through orifice. The high velocity flow under bottom of bucket keeps dirt in suspension, washes it out when trap opens. No dirt problems with Armstrong design.

3. . . . steam (light color) reaching the trap floats the inverted bucket and closes the valve.

BUCKET FLOATS WHEN LESS THAN ¼ FULL OF STEAM (See Fig. 3 above). The generous margin of safety (Dimension A in Fig. 3 above) insures that the bucket will float with trap body partly full of water. A heavier bucket would give more power but it might float and close the valve.

4. When more condensate enters, bucket loses buoyancy and pulls on valve lever.

NO AIR BINDING (See Fig. 4 above). Air mixed with steam passes through the bucket vent, collects at top of trap and is discharged ahead of condensate. The large air-handling capacity of Armstrong traps insures top equipment temperatures and faster heat-up.

5. When weight of bucket loses leverage overcomes pressure on valve, trap opens.

EXCESS POWER FOR OPENING (See Fig. 5 above). Armstrong design provides a generous safety margin. Reducing dimension B in Fig. 4 would increase power of bucket but margin between vent opening pressure and operating pressure would be too low to allow for normal wear and pressure fluctuations.

THE highly efficient design of modern Armstrong traps reflects over 40 years' experience in inverted bucket trap manufacture and application.

ARMSTRONG design offers:

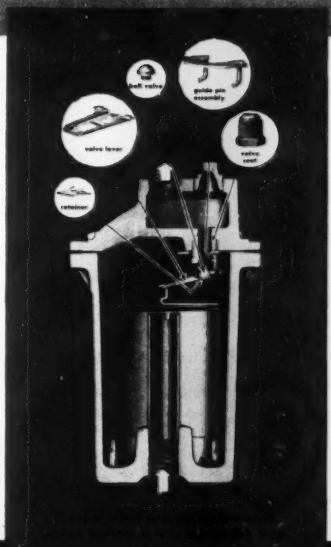
- A "frictionless" leverage system which combines high leverage with wide opening of a large orifice.
- A minimum of parts.
- Strong, corrosion-resistant and wear-resistant materials.
- Generous margins of safety.

FOR TRAP USERS this means:

- Large capacity.
- Dependable service under adverse operating conditions.
- Low maintenance.
- Continuous operation of heating and process equipment.

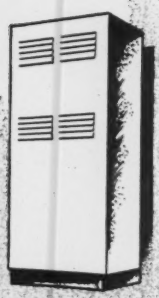
The soundness of Armstrong design has been proved in thousands of plants all over the world. To insure dependable condensate drainage simply specify: "Traps shall be Armstrong." For additional information, call your local Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Michigan



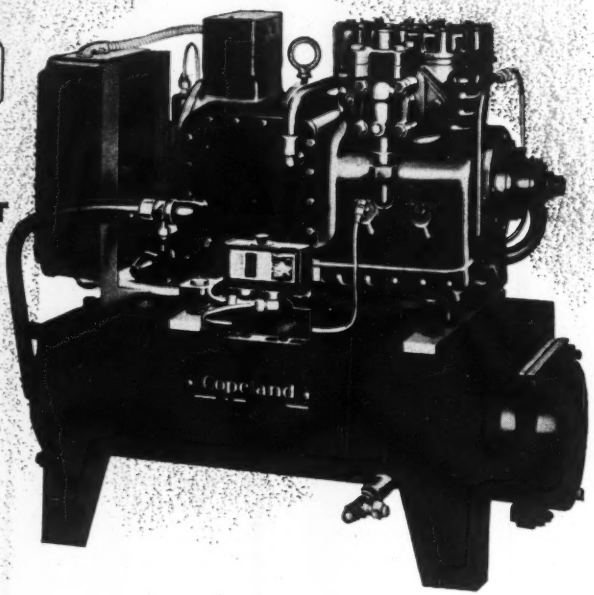
● *SEND FOR* NEW 44-PAGE STEAM TRAP BOOK. Complete data on Armstrong trap design and operation; physical data and list prices; capacities; selection, installation and maintenance recommendations Free on request.

ARMSTRONG STEAM TRAPS



COPELAMETIC

THE *Accessible* HERMETIC



condensing units and motor-compressors for all air conditioning requirements

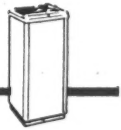
- ☑ COMPACT
- ☑ ECONOMICAL
- ☑ DEPENDABLE
- ☑ RUGGED
- ☑ QUIET

Copelametic is as modern as air conditioning itself. Its advanced design neatly combines the best qualities of open-type and welded-in units into one compact package. No belts, no seals, no manual oiling. It is fully accessible when the rare occasion arises.

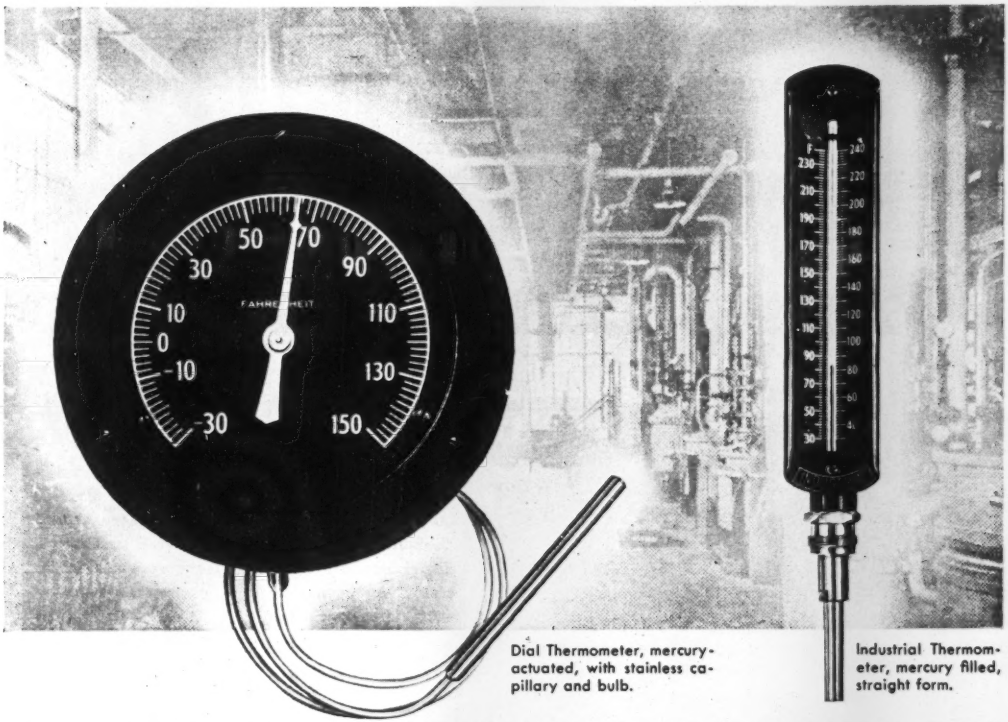
And the Copelametic is just one star performer in our dependable line. There is a rugged Copeland unit for every application in refrigeration and air conditioning. Sizes through 7½ H.P. Write today for complete data.

Copeland

DEPENDABLE *Electric* REFRIGERATION



COPELAND REFRIGERATION CORPORATION, SIDNEY, OHIO



Dial Thermometer, mercury-actuated, with stainless capillary and bulb.

Industrial Thermometer, mercury filled, straight form.

WILL THEY STAY HONEST WHEN THE HEAT'S ON?

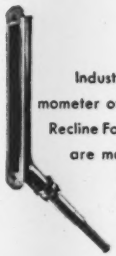
Rigid quality control and thorough testing of every USG Thermometer under actual operating conditions say *they will!*

So does the fact that USG sells no makeshifts. Regardless of your process or application, there's a USG Thermometer that suits it precisely. You may choose Industrial Types in all sizes, and mounting forms with standard or protected stems—or Dial Types in a variety of sizes, case styles, mountings, ranges and connections. *All* USG Thermometers—gas, mercury, or vapor-actuated—are built to the same high quality standards as USG Pressure Gauges!

If you're interested in typical applications of commercial and approved Navy Standards, dimensional information and the use of bushings, flanges, sockets and special tubing, send for Catalogs 100 and 200.

Special thermometers for dough testing, milk testing, fuel gas, candy, solder baths, varnish, canning, vulcanizing and other unusual processes.

Dial Thermometer with bottom-connected rigid stem, one of many USG types available.



Industrial Thermometer of the 45° Recline Form. There are many other standard forms.

UNITED STATES GAUGE

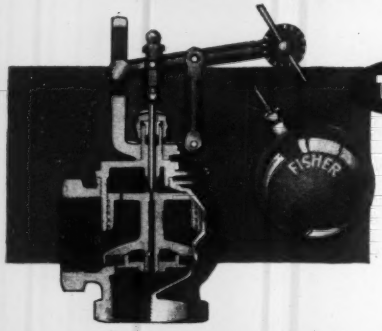
United States Gauge
Division of American Machine and Metals, Inc.
Sellersville, Pa.
Gentlemen: We are interested in USG ☐ Industrial Thermometers; ☐ Dial Thermometers. ☐ Please send us your catalog. ☐ Have your man call. No obligation, of course.

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

DEPEND ON FISHER®

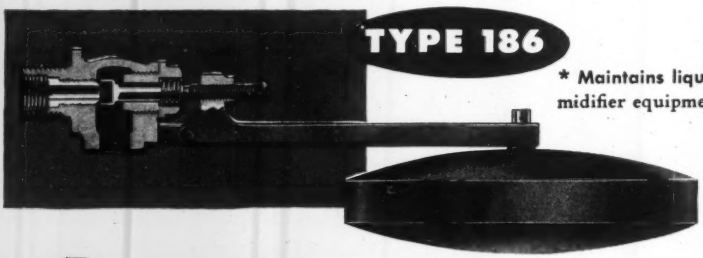
float valves

FOR GENERAL OPEN TANK SERVICE



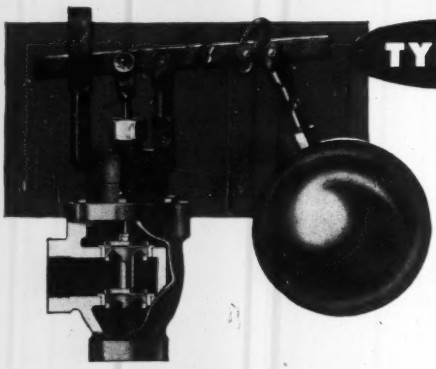
TYPE 171

* **Bronze float valve** for automatic control of liquid levels in all types of open vessels. Particularly recommended for service where positive shut-off is required. Single seated composition disc inner valve balanced by accurate fitting piston — fluctuating inlet pressures do not affect valve operation.



TYPE 186

* **Maintains liquid levels** in various types of humidifier equipment or in small tanks where flow rates are moderate. Suitable for all non-corrosive liquids. Composition valve disc assures positive shut-off.



TYPE 17

* **Maintains liquid levels** in open tanks, vats, reservoirs and similar containers by automatically controlling the flow rate to or from the vessel. Double seated V-port type inner valve provides throttling control — eliminates water hammer. Iron or steel body — bronze, stainless steel or other special metal trim.

Fisher float valves for automatically controlling liquid levels in all types of open vessels are available in various types and designs. Wide selection of body and trim material to handle different liquids. Complete description and details in Bulletin FG-70. Write for your copy today.

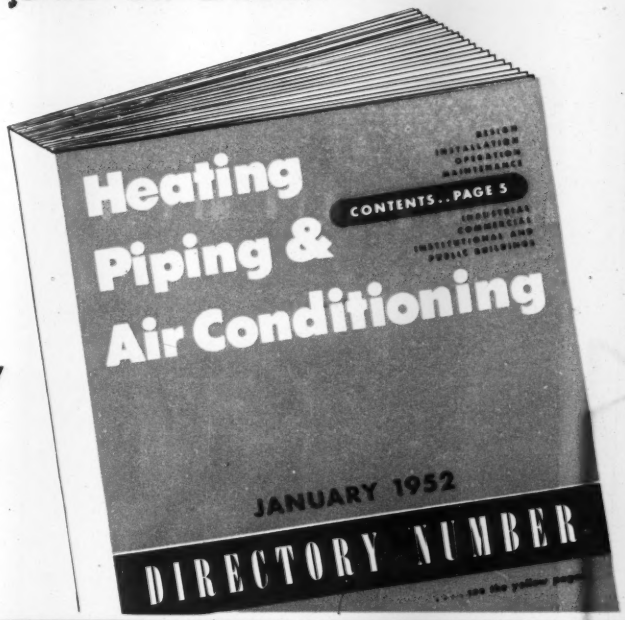
FISHER GOVERNOR COMPANY • Marshalltown, Iowa

FISHER®

WORLD LEADER IN THE MANUFACTURE OF LIQUID LEVEL CONTROLLERS, PRESSURE REGULATORS AND IN RESEARCH FOR BETTER CONTROL

"HELPFUL IN OUR WORK"

. . . that's How HP&AC Subscribers Rate the January Directory Edition



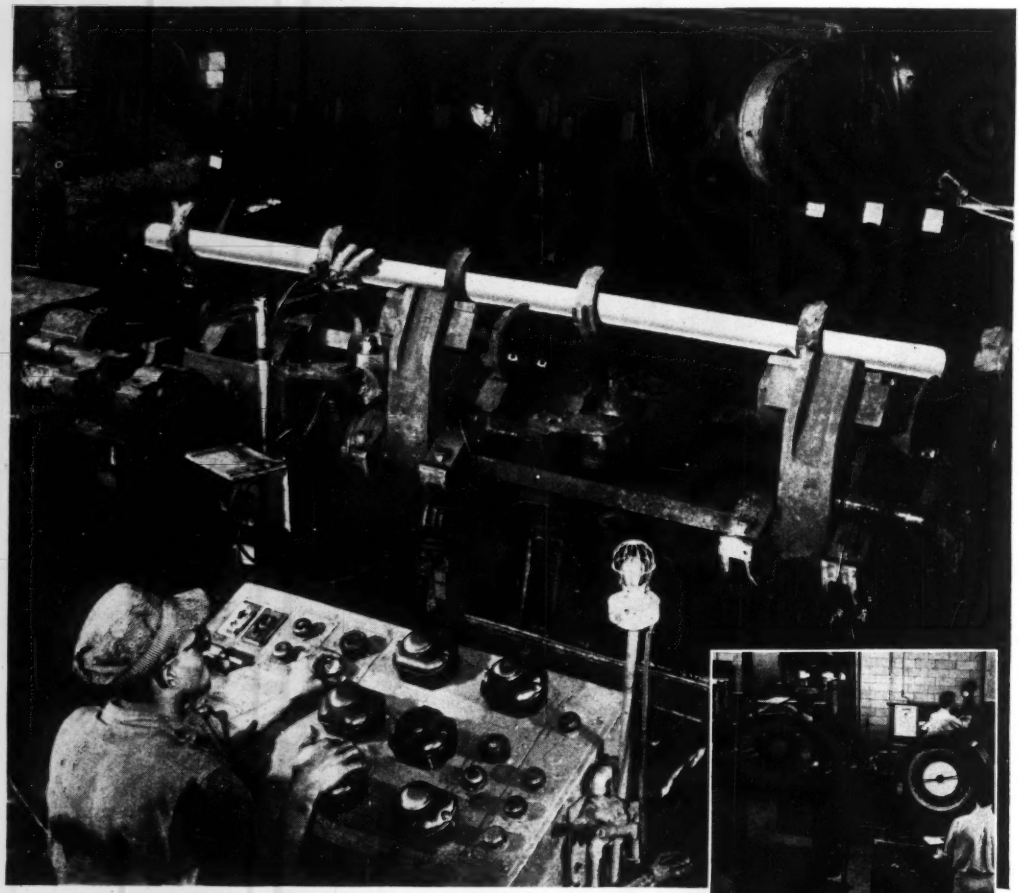
from an Indianapolis Consulting Engineer:

"Your January 1952 Directory issue will be kept here throughout the year. We refer to it almost daily. We consult the Directory section to find out who makes a product, then turn to the advertising pages for the detailed information we need."

90% of those HP&AC subscribers, answering a recent questionnaire, replied that they find the current Directory Number helpful in their work when product information is required. If you are a subscriber from whom we have not heard, your comments will be most welcome. As the result of this type response from engineers and contractors over the years, we feel that the Annual January Directory Number is a valuable part of your subscription to HP&AC. Do you agree?

FIRST *in Editorial . . . in Circulation . . . in Advertising*

Specify GLOBE for the finest steel tubes



Specialized research, engineering and production assure uniform high-quality STEEL TUBES

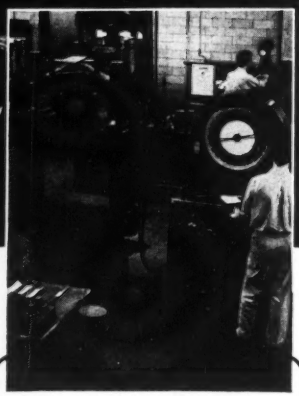
AT Globe, specialization is the keynote. Men, machines, and raw materials are all tailored to fit the Globe *specialized* process. Precision checks — and rechecks — at every stage of production insure Globe Tubes that meet *your* exacting specifications.

Be sure! Specify dependable, high-quality Globe Steel Tubes and be certain of getting the finest tubes available. Write for the General Catalog and become acquainted with Globe *specialized* process.

GLOBE STEEL TUBES CO., Milwaukee 46, Wisconsin

Chicago • Cleveland • Detroit • New York • Houston • St. Louis
Denver • San Francisco • Glendale, Cal. • Philadelphia

GLOBE TUBES

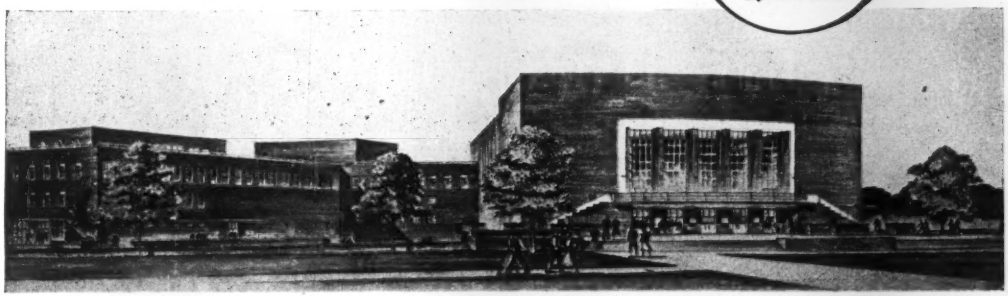


Globe's Physical Testing Laboratory — one of the seven different research and testing labs in Globe's House of Science.

GLOBE STEEL TUBES ARE AVAILABLE IN:

• Stainless Steels — Globe seamless • High Purity Iron — Globeiron • Stainless Steels Gloweld Welded • Corrosion Resistant Steels • Alloy Steels • Carbon Steel • High-Temperature Service Steels • Standard and Special Analysis Steels • Mechanical and Pressure Tubing

SCHOOL QUIET



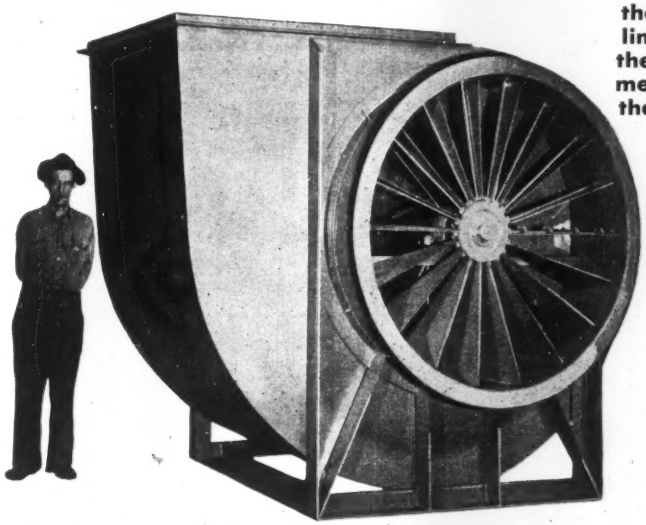
The new College Center and Arts Building, Brooklyn College, Brooklyn, N. Y., which is equipped throughout with GENERAL BLOWER fans.

Arthur A. Schiller: Board of Higher Education
Chapman, Evans & Delehanty: Architects
Parsons, Brinckerhoff, Hall & MacDonald: Engineers
Dierks Heating Company: Heating and Ventilating Contractors

GENERAL BLOWERS

Engineered for Quiet Operation

In hospitals, schools and other institutions, quiet operation of fans and blowers is a *must*. In addition, rugged construction is necessary to insure dependable operation under all kinds of operating conditions and maintenance. GENERAL BLOWER fans and blowers are specified by architects, engineers and contractors for use in college buildings, schools, hospitals, etc., because they combine sound engineering, rugged construction and quiet operation. In addition, the complete GENERAL BLOWER line makes it possible to select the exact fans and blowers to meet the needs of institutions of these types.



GENERAL BLOWER COMPANY

8622 Ferris Avenue
Morton Grove, Ill.

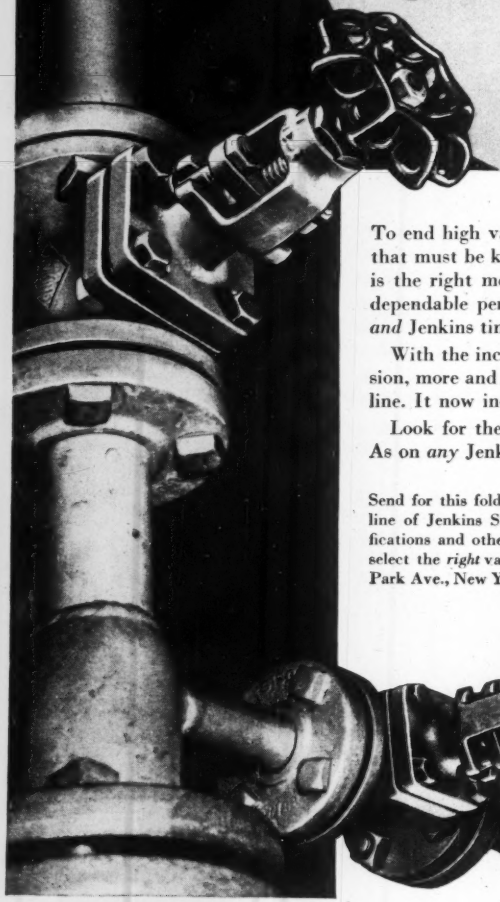
Twenty-five years' background in the fan and blower industry. Engineering offices in major cities.

Here's the hookup for valve-killing corrosive services...

Stainless Steel

PLUS

Jenkins Quality



To end high valve mortality from corrosive liquids, and to control fluids that must be kept free from contamination or discoloration, stainless steel is the right metal. But it takes more than metal to make a valve. For dependable performance, you need the two-way hookup—Stainless Steel *and* Jenkins time-proved Valve Engineering.

With the increased demand for processing equipment that resists corrosion, more and more Stainless Steel Valves have been added to the Jenkins line. It now includes types and sizes to meet most industrial needs.

Look for the famous Diamond trade-mark on valves of stainless steel. As on *any* Jenkins Valve, it means extra years of trouble-free service.

Send for this folder, Form 194, describing the complete line of Jenkins Stainless Steel Valves. It contains specifications and other important data that will help you select the *right* valves for your plant. Jenkins Bros., 100 Park Ave., New York 17, Jenkins Bros., Ltd., Montreal.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864

TRADE JENKINS MARK

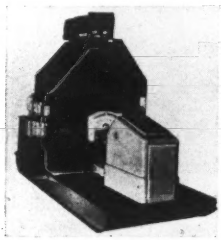
Jenkins Bros.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

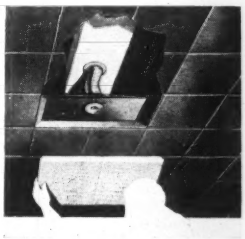
EQUIPMENT DEVELOPMENTS...

Unit Heater

HPAC 1—Portable, stoker fired unit heater for spot heating of specific areas in large warehouses and mills — Arthur A. Olson & Co., Canfield, Ohio. The heater shown is for either bituminous or anthracite coal. Heaters are also furnished with either oil or gas burning equipment. The large amount of heat transfer surface facilitates future conversion to gas or oil, the manufacturer states. The base of the heater acts as a sled for moving and a storage space for ashes. Heaters are delivered assembled, with stoker and refractory secured in place.



Heater



Panel

Ceiling Air Diffusing Panel

HPAC 2—"Modular Multi-Vent" ceiling air diffusing panel for heating, cooling and ventilating systems using either duct or plenum air supply — Multi-Vent Div., The Pyle-National Co., 1334 N. Kostner Ave., Chicago. It is designed for economical installation into metal pan ceilings. The panel delivers conditioned air at low velocities and affords overall air distribution by pressure displacement. There is a resulting absence of strong air streams, and problems of outlet location and air direction adjustments for throw and drop to avoid drafts are eliminated, the manufacturer states. Since no air movement in excess of ASHVE comfort zone requirements exists more than 6 in. away from the panel, it can be located anywhere in the ceiling, regardless of ceiling height. The panels, concealed by standard perforated metal ceiling pans, effect a temperature differential of as little as 1 deg within the comfort zone, and handle large volumes of air in proportion to room size, the company states.

The assembly comprises the panel (12 x 24 in.), an orifice valve (adjustable with a wing nut), and a fiber glass tubing for connecting the panel with the air supply duct. The panel fits into any standard acoustical metal ceiling pan. This pan, with acoustical pad removed, functions as the distribution plate for the panel. All components are attached and aligned in the ceiling without the use of tools. Ducts can be shop built and precut with 3 in. diameter holes for the tubing connections, and can be installed prior to ceiling construction. Tubes are snapped into duct openings and the system is balanced by adjusting valves in the end of each tube. The panels are attached to the flexible tubes by twisting the lock on the tubing collar. They align themselves in the designated ceiling pan, replacing the acoustical pad. The individual pans containing the panels snap into the tee runners in the same way as the pans containing pads.

Air Filter

HPAC 3—"Ultra-Aire" space filter, designed to remove from the air particles ranging in diameter from 0.05 to 0.1 of a micron, for applications where toxic and radioactive particles are a threat to health or production processes —Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh 8. Originally developed to remove radioactive contamination from air exhausted during atomic energy plant operations, the filter has been tested against

For your convenience in obtaining more information about any of this equipment, use this coupon. Add the new products and companies listed here to your Directory Section which you received in your January 1952 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

FOR YOUR CONVENIENCE [7-52]

Heating, Piping & Air Conditioning
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under these numbers in Equipment Developments and Recent Trade Literature

(Circle each HPAC number in which you are interested)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
116	117	118	119	120	121	122	123	124	125	127	128	129	130	131
132	133	134	135	136	137	138	139	140	141	142	143	144	145	146
147	148	149	150											

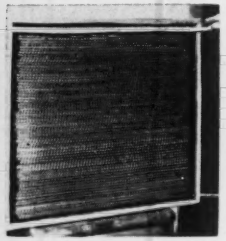
Name _____ Title _____

Company _____

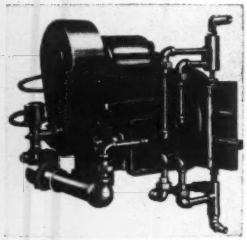
Address _____

City _____ Zone _____ State _____

fine chemical smoke and is certified by the manufacturer to be at least 99.95 percent efficient against particles as small as 0.3 micron in diameter. There are 46,000 sq in. of filter medium in the 1000 cfm size; the filter also is available in air flow sizes of 50 and 500 cfm. Its effective service life, when protected by a roughing filter, is about a year and a half, the company states. Specific applications include operating rooms, experimental laboratories, pharmaceutical production, film processing, food processing plants, etc.



Filter



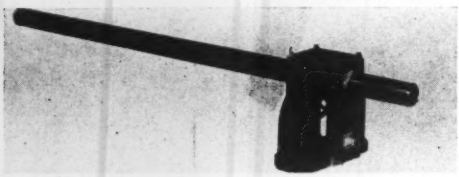
Burner

Rotary Oil Burners

HPAC 4—Horizontal type rotary oil burners, formerly used exclusively with the manufacturer's steam generators, now available for conversion and replacement use and for new installations in the commercial and industrial fields — Superior Combustion Industries, Inc., 1475 Broadway, New York 18. The burner provides automatic operation, precise control of firing rates, and accurate control of flame contour, the manufacturer states. There are a v belt drive for high cup speed; a four-hole hinge for circulating oil through the oil heater so that oil is on the pressure side of the pump, allowing it to be burned at higher temperatures; an adjustable air nozzle; and dual pumps and reservoir. The equipment will burn any grade of oil, and is available with combined gas burner for any type of gas. It is fully automatic in sizes to 500 bhp, with dual ignition and high-low, or fully modulating control.

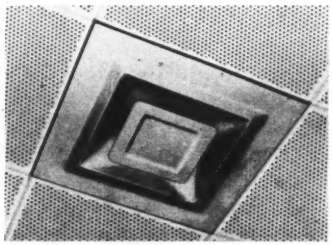
Flow Meter for Molten-Metal

HPAC 5—Magnetic flow meter for the remote measurement of molten-metal flow — Special Products Section, General Electric Co., Schenectady 5, N. Y. With its sensing element external to the flowing liquid, the flow meter is designed to afford maximum safety where hazardous metals such as sodium, lead-bismuth, and sodium potassium alloys must be metered. Eliminating all movable parts and physical obstructions to fluid flow, it consists of a permanent magnet with a pipe centered between the magnet pole faces. As the metal flows through the pipe, it cuts the magnetic lines of flux, generating a small directional voltage in the pipe proportional to the amount of magnetic flux and the rate of metal flow. The voltage is picked up off the pipe to two stainless steel wires and transmitted to an instrument showing flow rate or to a recording meter. Any potentiometer type indicating or recording instrument may be used. The sensing head will accommodate flow in pipe sizes of ½, ¾, or 1 in. Accuracy is ± 3 percent.



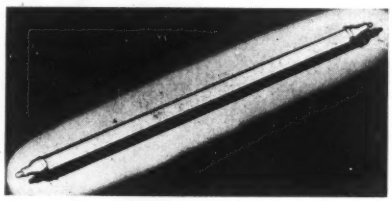
Square Ceiling Air Diffuser

HPAC 6—Square diffuser styled for acoustic-type ceilings and designed to retain the advantages of circular outlets — W. B. Connor Engineering Corp., Shelter Rock Lane, Danbury, Conn. Though square in appearance, the diffuser discharges supply air in a single stream, circular pattern which produces rapid entrainment or mixing with the room air, the manufacturer states. It has identical discharge characteristics in all sizes. For example, at constant neck velocity, the resistance or static pressure required for either a 4 or 14 in. unit will not vary. The units are available in neck sizes from 4 to 14 in., either to overlap or fit the individual tiles.



Germicidal Lamp for Air Ducts

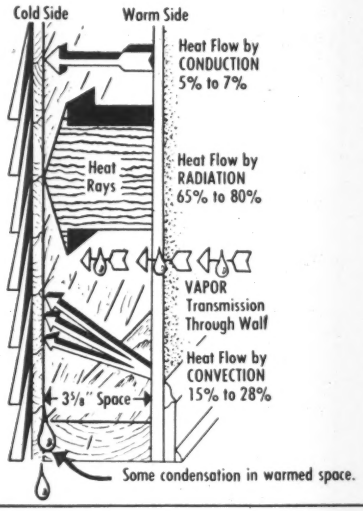
HPAC 7**—1200 watt, high intensity germicidal ultraviolet lamp designed for use in air ducts and areas where a large amount of killing power is desired — Cooper Hewitt Electric Co., 720-732 Grand St., Hoboken, N. J. Each lamp is equivalent in germicidal energy to approximately 15 or more conventional germicidal lamps, lowering cost of initial installation, replacement and maintenance, the manufacturer states.



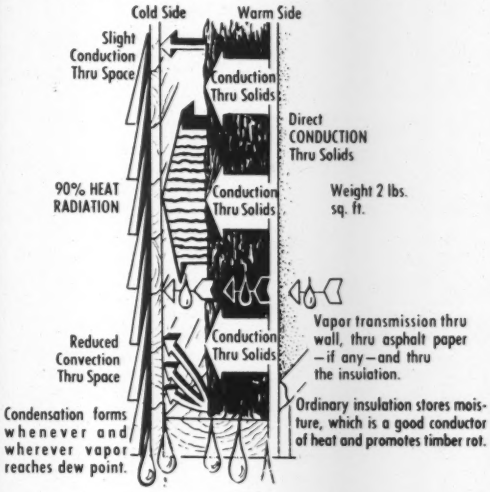
Stainless Steel Pipe Fitting

HPAC 8—"Quikupl" stainless steel fitting for joining pipe or tube without threading, flaring, sweat soldering, brazing, beading, or welding — The Cooper Alloy Foundry Co., Hillside 5, N. J. The tube or pipe is cut to length and deburred, then inserted into the fitting. The joint is completed by the tightening of a small screw. The fittings (elbows, tees, couplings, reducers and adapters), which permit the use of light wall tubing, are in the 150 psi class, and retard turbulence and pressure drop, the

Heat & Vapor Flow Thru Air Spaces In Non-Insulated Wall


Cold Side
Warm Side
Heat Flow by CONDUCTION 5% to 7%
Heat Rays
Heat Flow by RADIATION 65% to 80%
VAPOR Transmission Through Wall
Heat Flow by CONVECTION 15% to 28%
3⅜" Space
Some condensation in warmed space.

Heat & Vapor Flow Thru Wall Space With Ordinary Insulation


Cold Side
Warm Side
Slight Conduction Thru Space
Conduction Thru Solids
Direct CONDUCTION Thru Solids
90% HEAT RADIATION
Conduction Thru Solids
Weight 2 lbs. sq. ft.
Vapor transmission thru wall, thru asphalt paper —if any— and thru the insulation.
Reduced Convection Thru Space
Conduction Thru Solids
Ordinary insulation stores moisture, which is a good conductor of heat and promotes timber rot.
Condensation forms whenever and wherever vapor reaches dew point.

For more efficient cooling and heating systems...

Performance failure by insulation unduly burdens heating and air-conditioning plants. Insulation specification is too often automatic.

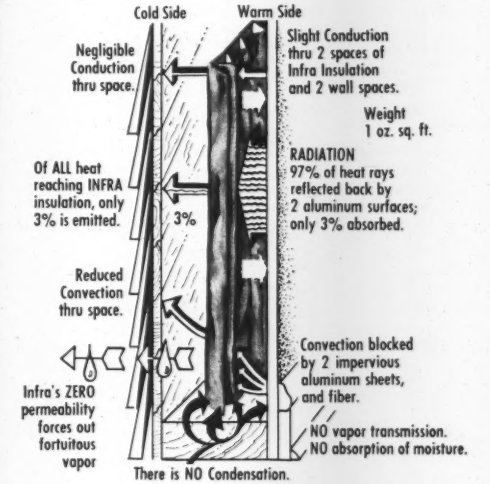
Ordinary insulation also promotes condensation, absorbs and retains moisture. Wet, it is an excellent conductor of heat, and promotes timber rot. Wet insulation tears away at points of fastening, for instance in crawl spaces, leaving the structure uninsulated.

Loose fill insulations settle down, become denser and better conductors of heat. The spaces they leave empty are deprived of the insulation originally planned.

Not all insulations perform with the same efficiency. (Consult the Chart of Thermal Insulation Values in Schwartz's "Simplified Physics of Vapor & Thermal Insulation," sent free on request. The chart shows at a glance *k*, C, R, and U thermal factors, of all insulations, of all thicknesses, their weights, densities, etc.)

Multiple accordion aluminum's rating is especially good, and permanent. Of all heat transferred through structural spaces, 50% to 80% is by Radiation, all but 5% of the rest is Convection. Multiple accordion aluminum sheets throw back 97% of the heat rays which strike them. They block Convection. Their insignificant mass, with multiple air space compartmentation, defeats Conduction.

The permeability of multiple accordion aluminum to water vapor, to cold and warm air and other gases, is zero. Its structure permits no dew-points to be reached on its surfaces or within it. It neither sustains nor retains moisture. It cannot deteriorate, is flame-resistant, repels insects, rodents and mold. Its commercial forms are Infra Insulation, Types 6, 4, and 4 Jr.


Cold Side
Warm Side
Negligible Conduction thru space.
Slight Conduction thru 2 spaces of Infra Insulation and 2 wall spaces.
Weight 1 oz. sq. ft.
RADIATION 97% of heat rays reflected back by 2 aluminum surfaces; only 3% absorbed.
Of ALL heat reaching INFRA insulation, only 3% is emitted.
3%
Reduced Convection thru space.
Convection blocked by 2 impervious aluminum sheets, and fiber.
Infra's ZERO permeability forces out fortuitous vapor
NO vapor transmission. NO absorption of moisture.
There is NO Condensation.

Heat & Vapor Flow Thru Wall Space With Multiple Accordion Aluminum

INFRA THERMAL FACTORS. TYPE 6

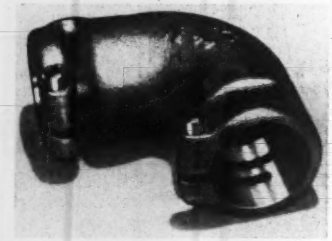
Up-Heat	**C.089, R 11.23 =**	**4⅗" dry rockwool**
Wall-Heat	**C.073, R 13.69 =**	**5⅛" dry rockwool**
Down-Heat	**C.044, R 22.72 =**	**9" dry rockwool**

INFRA INSULATION INC.

525 Broadway New York N. Y.

Infra Insulation, Inc., 525 Bway., N. Y. C. Dept. H-7
Please send FREE "Simplified Physics of Vapor and Thermal Insulation."
Name_____
Firm_____
Address_____
☐ Send Prices of Infra Insulations ☐ Send Sample

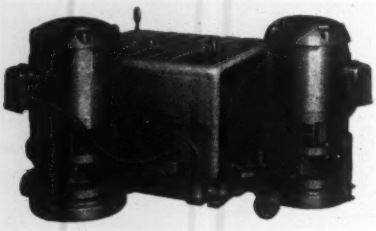
manufacturer states. Inside the fitting is a synthetic sealing ring contained in a groove machined into the bore of the fitting. The seal provides a squeeze fit within commercial stainless tube or pipe tolerances. As pressure is applied to the lines, the seal is forced to the outside face of the groove, filling the space between fitting and pipe.



The fitting can be used with schedules 5, 10, 40 and 80 pipe sizes without changing from one fitting to another, and with a variety of tube wall thicknesses if OD remains the same. The fittings are recommended by the manufacturer for use in stainless steel pipe lines used in the processing of corrosive liquids, or in industries where contamination is a factor.

Condensation Pumps

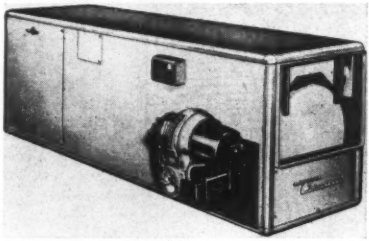
HPAC 9—Vertical, close coupled condensation pumps in two types, one for high temperature operation, the other for low pressure heating systems — Hoffman Specialty Co., 1001 York St., Indianapolis 7. The Type C (high temperature) centrifugal pump is available in duplex (illustrated) and single units, with capacities ranging from 1000 to 150,000 sq ft EDR. The packing gland is of the split type, and all submerged parts are of bronze or other



non-corrosive material. The float switch mechanism can be removed as a unit and is adjustable to individual requirements. The "Watchman" (low pressure) pump, with a 1/3 hp standard Nema "C" flange motor, has a one piece bronze impeller, double pole float switch and 12 gallon cast iron receiver. The entire motor and impeller assembly can be removed as a unit without disconnecting piping. Floor space occupied is 18 x 24 in., and capacities are up to 8000 sq ft EDR, 20 lb discharge pressure.

Suspended Winter Air Conditioner

HPAC 10—Type 253 horizontal oil fired, suspended type winter air conditioner for commercial and residential installations — L. J. Mueller Furnace Co., 2005 W. Oklahoma Ave., Milwaukee 15. It may be suspended as a unit heater in shops, schools and similar installations. The unit is now available in one size, 110,000 Btu input, but soon will be offered with inputs up to 225,000 Btu. It is completely updraft in design, and may be converted to gas with the company's specially designed gas package. It contains a large multi-blade centrifugal type blower. The heat exchanger provides long flue travel and is clean-



able without lowering of the unit or removing the furnace casing. The flue outlet is at the back, and there is an observation port which also serves as a pressure relief door.

Fuel Oil Detector and Preheater

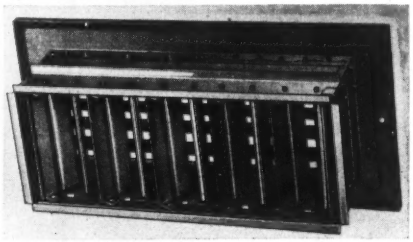
HPAC 11—Fuel oil detector and preheater for use below the water line with No. 6 (Bunker "C") fuel oil — Yula Water Heaters, Inc., 166 West 225th St., New York 63. The equipment consists of the company's U tube preheater with a coupling on top of the shell, to receive the probe fitting, and a special oil de-entrainment chamber on the bottom of the shell; a relay box with amber and green lights and an alarm bell; and a probe with special fittings. Standard units are furnished for 220 volt, 60 cycle, single phase relay contacts rated at 10 amp.

Industrial Chilling Machine

HPAC 12**—Model R-70 industrial chilling machine for testing procedures with temperature requirements of —10 to —80 F — Sub-Zero Products, Cincinnati 29. It is equipped with a chilling chamber 30 in. x 18 in. x 33 in. deep, with more than 22 sq ft of freezing surface. Thermal capacity of the unit is 800 Btu per hr at —70 F. Outside dimensions are: height 47 in., length 48 in., width 43 in.

Air Volume Controller

HPAC 13—AG-35 volume controller, affording rapid adjustment, since the air conditioning systems utilizing it can be balanced without removal of the grille — Titus Mfg. Corp., Waterloo, Ia. A key operator regulates the air volume from the front of the grille. Louvers on the new



grille close at 45 deg, maintaining a metering control down to the final moment of closure and minimizing disturbance of the air pattern, the manufacturer states. The controller can be specified as a single unit or combined with any "Airfoil" grille as a one unit combination.

(*Continued on Page 206*)

HOT JOBS call for COOL HELP!

Pouring liquid steel into ingot moulds at a temperature of 2800° F. is a hot job that demands skill and constant attention. When workmen are exposed to such intense heat, thermotic fatigue can be a real problem.

At Colorado Fuel and Iron Corporation's mill in Pueblo, Colorado, they solved the problem by mounting a DeBothezat "Hy-V" Air Jet on the cab of the crane which handles the ladle, so that the fan unit travels right with the men as they work. "Hy-V" Air Jets project a concentrated stream of fresh air as far as 35 feet, without the use of ducts, to keep workers comfortably cool, alert and efficient.

DeBOTHEZAT "HY-V" AIR JET is a 14-blade axial-flow pressure fan in a nozzle-shaped housing. It can be furnished with a bracket for wall installation or it can be mounted on a portable wheeled stand. Both types are available with fan wheels from 18" to 30" in diameter, with capacities up to 12,000 CFM.

Ask your DeBothezat Fans representative or write the factory today for a bulletin on "Hy-V" Air Jets. Address Dept. HP752.

Certified Ratings

AMCA

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

Check First with Dutton

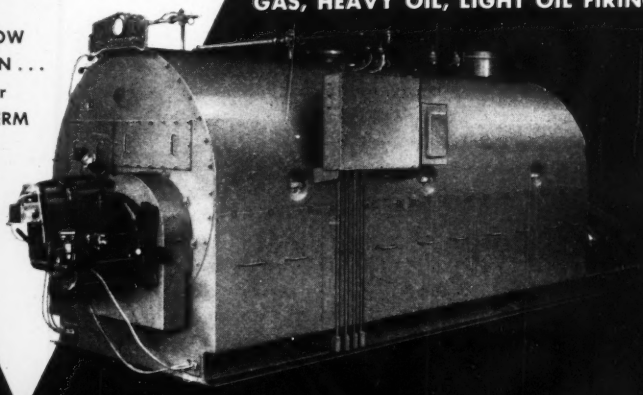
FOR ONLY THE DUTTON ECONOTHERM GIVES YOU OFF-CENTER FIRING

AND ...HERE'S THE EXTRA ADVANTAGE OF OFF-CENTER FIRING

Induces positive, fast water circulation in a rotary motion, resulting in uniform water temperature in shell . . . faster steaming . . . elimination of surging and priming . . . a steady water line at all times . . . higher quality, dry steam . . . and a higher column of water above the furnace. Every point makes sense — makes performance too!

CHECK NOW with DUTTON . . . write for ECONOTHERM Bulletin EC-100G.

COMPACT • SELF-CONTAINED • FULLY AUTOMATIC • ROTARY COMBUSTION • UNUSUAL EFFICIENCY, SAFETY • GAS, HEAVY OIL, LIGHT OIL FIRING



Other types and sizes — 5 to 250 h.p. See the Yellow Pages in Phone Book for Dutton Representative.

Dutton BOILERS

DIVISION HAPMAN-DUTTON COMPANY

KALAMAZOO, MICHIGAN • BOILER BUILDERS SINCE 1880

Back the Pumps You Use with Nation-Wide Service!

"Follow-Through" like this Makes Friends!

YOUR CUSTOMERS are ours too, once your equipment gets into the field. Allis-Chalmers network of Certified Service Shops assures fast service help wherever the user may be . . . relieves you of one part of your servicing problem.

Engineering Help Too!

Allis-Chalmers engineers can help you pick the type and size pump that best fits the conditions of the job. In addition, they can help check for proper pipe sizes and help work out any design modifications in the pump you may need.

And Allis-Chalmers has the pumps too! There's a type and size pump for practically every job, from fractional units up to the biggest.

Call your nearby Allis-Chalmers district office for complete information, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3710

Electrifugal is an Allis-Chalmers trademark.

ALLIS-CHALMERS

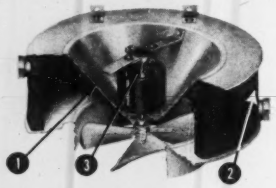
ELECTRIFUGAL PUMP — a close-coupled pump with both ample maximum space for packing maintenance and exceptional rigidity. From motor end housing to pump casing, frame is one piece of cast iron. Sizes 10 to 1600 gpm; heads to 525 feet.

PACKAGE PUMP — with open or closed impeller. Widely used for air conditioning and refrigeration. Made in several fractional horsepower sizes using NEMA standard motors of well-known make. Capacities to 80 gpm; heads to 100 feet.

PEDESTAL MOUNTED PUMP—For use where flexible coupling or V-belt drive is desired. Essentially the same pump as package pump at left, except that bearing bracket is substituted for motor. A-C also furnishes motor, drive, control. See ratings at left.

VERTICAL MOUNTED PUMP — Open impeller unit with special cover plate and flange for vertical mounting. Used in air conditioning to save piping cost. Also used as coolant pump for machine tools. Capacities to 80 gpm; heads to 100 feet.

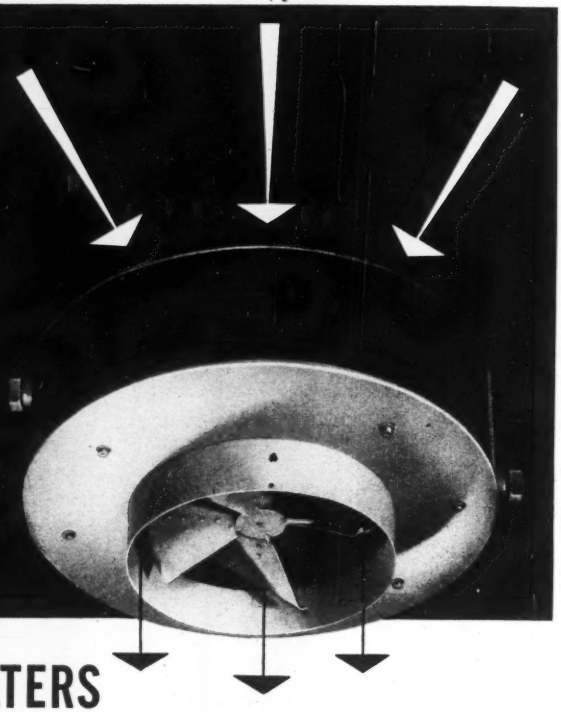
Outstanding Features of Dunham Heaters



1. Sturdy motor support cone effectively funnels air from heating element to fan; protects motor against heat and dust.

2. Improved header design requires fewer solder joints; assures uniform steam distribution; eliminates air pockets.

3. Resilient motor mounting absorbs motor vibrations, prevents transmission of noise through piping.



DUNHAM UNIT HEATERS

direct heat where you need it

quietly . . . economically . . .

Dunham Vertical Discharge Unit Heaters are designed to maintain perfect balance between air volume, velocity, and final air temperature. When you "buy Dunham," you get:

Heat Where You Need It—Choice of four different types of air diffusers assures proper directional control of heat throw; high volume of air funneled through fan promotes uniform heat distribution in a wide pattern.

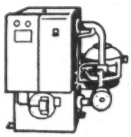
Quietly—Rubber-mounted motor minimizes vibration and noise; fans operate at slow speeds.

Economically—You cut installation costs. Location of supply and return tappings gives simplified piping hook-up with fewer fittings.

Another good point to remember: Dunham Unit Heaters are available in Horizontal Discharge, Blower Fan, as well as Vertical Discharge Types. Their quality performance is typical of *all* Dunham products. For example, Dunham Vacuum Pumps can pull *up to 26 inches* of vacuum year after year.

For further information on Dunham Unit Heaters, write for Bulletin 1301-2. Similar literature available on other products.

Horizontal Heater



Vacuum Pump

C. A. DUNHAM COMPANY
400 West Madison Street, Chicago 6, Illinois
In Canada: C. A. Dunham Co. Ltd., Toronto
In England: C. A. Dunham Co. Ltd., London

DUNHAM heating systems and equipment

Vari-Vac Differential Heating • Baseboard Radiation • Fin-Vector Radiation • Convector Radiation
Condensation Pumps • Traps • Valves

HOLES
HOLES
and more HOLES
1500 of them

To be sure, this may be an unusual job. However, it proved the flexibility and practicability of the Bullard Spacer.

It required several combination of settings between the work location on the table and the drill saddle and arm.

However, the actual set-up and machining time figured 5-½ hours for the Spacer instead of 11-½ by the best previous method.

This case study illustrates the possibilities and wide application of the Bullard Spacer.

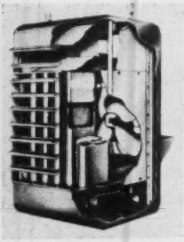
Here is a machine for spotting, drilling, counterboring, reaming, or tapping—without jigs.

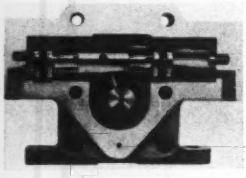
Ask Bullard Engineers how your Jig Costs and problems can be reduced.

(Continued from Page 200)

Gas Fired Unit Heaters

HPAC 14—Five models of a new line of suspended gas fired heater units, all AGA approved for natural, mixed, manufactured and propane gases, and with an input range of from 55,000 to 200,000 Btu per hr — The National Radiator Co., Johnstown, Pa. They are designed for use in markets, stores, factories, institutions, and similar applications. Each unit is equipped with automatic controls and packaged in a heavy gage steel housing. An individual burner is provided for each heat exchanger tube. Individually adjustable louvers direct the flow of heated air. The overlapping blade type electric fan operates on 110 or 115 volt, single phase, 60 cycle current. During warm weather, the gas supply can be shut off and the fan operated separately. The hangers, with standard pipe threading, are part of the unit. A vent connection is provided.





Above: Valve

Left: Heater

Power Operated Valve

HPAC 15—POV power operated valve, in six sizes, for air, oil and water operation with optional finger, cam, toe or solenoid pilot controls — Ledeen Mfg. Co., 1600 S. San Pedro St., Los Angeles 15. Applications include remote control, where operation must be a distance from the valve; automatic operation, where movement of some mechanism must start the valve to create another movement; reciprocating service, where the cylinder must move continuously back and forth; and safety, where a failure of electric power or line pressure must reverse the valve. This is essentially a standard four-way valve, but the rotation of the disc is accomplished by means of a piston moved by the operating fluid pressure of the main line and controlled by pilot valves. Applying pressure through the pilot on one end of the piston forces it to move ahead and rotates the valve disc to forward position. Pressure on the opposite end moves the piston back, rotating the disc to reverse position.

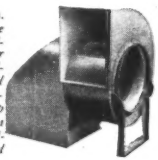
Internal Downflow Purifier

HPAC 16—"Hi-ef" internal downflow purifiers for installation in an auxiliary tank immediately above evaporators, packed towers, deodorizers, steam drums, flash tanks, receivers and other vessels, designed to remove dirt, moisture, riser discharge and solids before they pass on to the distribution piping — V. D. Anderson Co., 1935 W. 96th St., Cleveland 2. In boiler applications, the purifiers deliver vapor with 1.0 ppm or less of total solids, and in other uses remove 99 percent of all entrainment, the company states. The separating element is so designed that units maintain a constant separating efficiency even as velocities become greater. A multi-stage centrifugal ele-

A fan for every need from HERMAN NELSON

Direct Drive Unit Blowers *are available in 12 models. Wheel sizes from 4" to 11". Choice of speeds available in each size. These units may be mounted on floor, wall or ceiling.*

Belt Drive Unit Blowers. *Available with either the quiet, slow speed, forwardly curved blade wheel or the efficient, non-overloading, backwardly inclined blade wheel. Wheel diameters to 30" Capacities up to 18,300 cfm. All Herman Nelson Unit Blowers available for any discharge and rotation.*



Belt Drive Propeller Fans *These versatile units deliver maximum amount of air effectively . . . quietly. Operate horizontally or vertically. Wheel diameters from 24" to 54". Capacities up to 36,000 cfm.*

Direct Drive Propeller Fans. *Both small sizes for use in offices, laboratories, etc., and also heavy duty units commonly used where contaminated air cannot penetrate the totally enclosed motor. Sizes from 14" to 36". Capacities up to 14,600 cfm.*

Write for detailed information about any type Herman Nelson Fan to Dept. HP-7

AAF herman nelson moline illinois

HERMAN NELSON

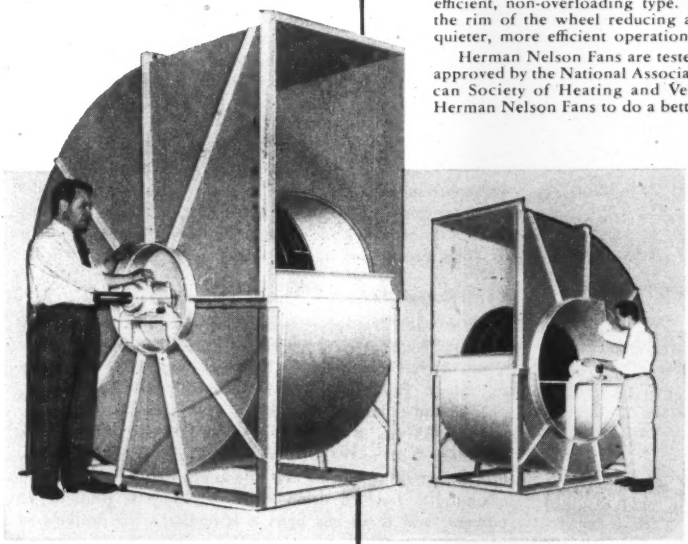
Division of AMERICAN AIR FILTER COMPANY, INC.

MOLINE, ILLINOIS

NEW FAN DESIGN!

BY...

HERMAN NELSON



INCREASES *strength—durability.*

• Herman Nelson, producer of centrifugal fans for over 35 years, again leads with major improvements. Class I and II Fans have been redesigned for better performance, trouble-free operation.

Herman Nelson Class I and II Centrifugal Fans, with wheel diameters from 40" to 73", are now made with ribs welded to the side sheets and extended radially from the hub. Deflection of the side sheets is reduced 80%. This assures additional strength, extra durability.

All welded construction makes fans dust-proof and leak-proof as well as extra strong.

These fans are available with either quiet, slow speed wheels or the efficient, non-overloading type. The streamlined inlet cone continues to the rim of the wheel reducing air turbulence and permitting smoother, quieter, more efficient operation.

Herman Nelson Fans are tested and rated in accordance with the code approved by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers. You can count on Herman Nelson Fans to do a better job.

FEATURES:

- **Radial ribs for extra sturdiness.**
- **All welded construction.**
- **Easy accessibility for service.**
- **Smooth interior of housing permits unobstructed air flow.**
- **Each wheel dynamically and statically balanced.**

AAF herman nelson moline illinois

HERMAN NELSON

Division of **AMERICAN AIR FILTER COMPANY, INC.**

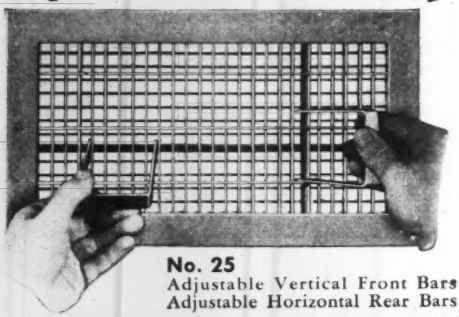
MOLINE, ILLINOIS

INDEPENDENT

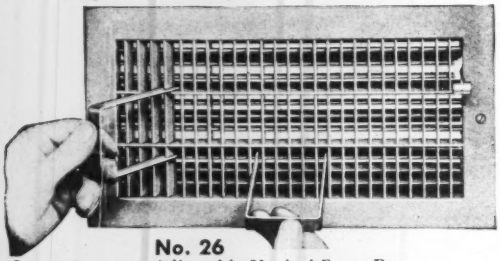
"Fabrikated"

DOUBLE CORE ADJUSTABLE BAR WALL GRILLES AND MULTIPLE VALVE REGISTERS

Each Grille Bar Adjusted Individually



No. 25
Adjustable Vertical Front Bars
Adjustable Horizontal Rear Bars



No. 26
Adjustable Vertical Front Bars
Adjustable Horizontal Rear Bars—with Horizontal Multiple Valves.

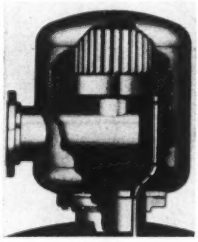
Depth with valves closed 1⅞"
Depth with valves open 2¼"

MEMBER NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION INDOOR COMFORT

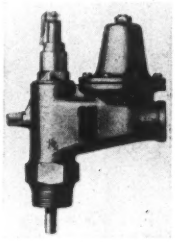
Always Leading • Always Progressing

THE INDEPENDENT REGISTER CO.
3747 E. 93rd STREET • CLEVELAND, OHIO

ment engages the entrainment laden vapor at the inlet at the top of the purifier, as far away from the liquid level in the drum as possible. In three stages, dirt, moisture, etc., are removed, and the cleaned stream is then passed on through the outlet; foreign matter is discharged to a drain. Made in fabricated steel, stainless, or other alloys in outlet sizes of 4 in. to 24 in., units are furnished with slip joint connections or can be threaded in sizes 4 through 10 in. Upflow purifiers also are available.



Purifier



Valve

Combination Temperature and Pressure Relief Valves

HPAC 17—Combination temperature and pressure relief valves incorporating a thermostat of non-corrosive, solid copper wall construction, which operates on a piston principle — Watts Regulator Co., Lawrence, Mass. The bulk of its thermal fluid fill is concentrated in a bulb at the lower end of the thermostat, where it can be influenced directly by the actual tank temperature. The expansion energy, in the bulb, is transmitted through a capillary tube to the piston, which lifts the disc from its seat. The valves are available in three series: Type N40 for small installations (up to 500,000 Btu per hr); No. 240 (heat input up to 1 million Btu per hr) with test lever, extension, and replaceable thermal element which can be installed without removing the valve from the tank; and No. 340 pilot operated valve (illustrated) for the largest institutional, industrial, and commercial uses (tested capacity of 3 million Btu per hr at 30 lb).

Centrifugal Fan

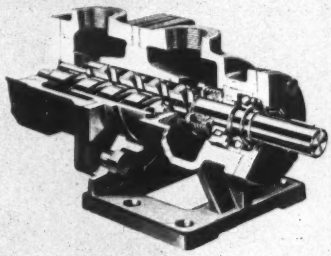
HPAC 18—Non-overloading, centrifugal fan designed to afford high efficiency with less noise intensity — Sturtevant Div., Westinghouse Electric Corp., 200 Readville St., Hyde Park, Boston 36. Intended to fill industry, power, and commercial building needs, the fan ranges in wheel size from 10¼ to 108¾ in. in diameter and delivers volumes of up to 600,000 cfm. The airfoil blade design, along with simultaneous aero-dynamic changes in inlet and casing, has boosted mechanical efficiency at peak to 92 percent, and there has been a reduction of 5 decibels in noise level, the manufacturer states.

Electronic Humidity Control

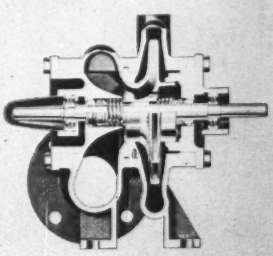
HPAC 19—Two position or proportioning, humidifying or dehumidifying electronic humidity control for process or comfort conditioning — Barber-Colman Co., Rockford, Ill. The plug-in, moisture-sensitive element changes resistance instantly with minute changes in relative humidity, the manufacturer states. In spaces supplied by a central

DE LAVAL STANDARD PRODUCTS *are easy to specify*

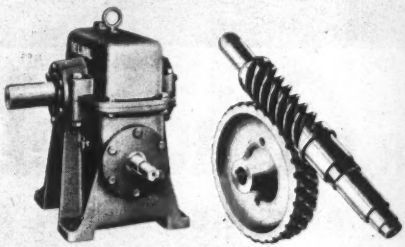
IMO Rotary Pumps



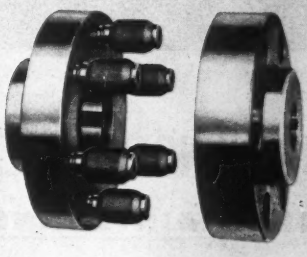
GS Centrifugal Pumps



Worm Gear Speed Reducers and Sets



Crown Couplings



You can save time by selecting the equipment you need from these precision-made De Laval standard products. They are designed to handle a wide range of applications . . . at low cost. Many products are "on the shelf," ready for immediate delivery.

IMO Rotary Pumps—The A313A IMO—for general hydraulic and oil handling services—capacities to 80 gpm—pressures to 150 psi. The A313B—for variety of hydraulic and oil handling services—capacities to 80 gpm—pressures to 275 psi (constant).

GS Centrifugal Pumps—In the GS pumps, mechanical seals eliminate stuffing boxes—permanently lubricated ball bearings eliminate lubrication. Capacities to 400 gpm, heads to 230 feet.

Worm Gear Speed Reducers and Sets — Made in horizontal and vertical, single and double reduction units for ratios to 8000:1 for transmitting up to 250 hp.

Crown Couplings—Unique crowned bolt in De Laval Crown Couplings distributes stresses over a greater area than a straight bolt, resulting in longer life.

DL149

DE LAVAL *Standard Products*

Send for your complete set of De Laval easy-selection manuals. Write today.

DE LAVAL STEAM TURBINE COMPANY
Trenton 2, New Jersey

YOU PAY NOTHING EXTRA FOR Amocel

...THE MAINTENANCE-SAVING PIPE INSULATION

Amocel for commercial uses—like famous Unarco higher-temperature Unibestos—is made from strong, resilient Amosite asbestos fiber. Designed for temperatures up to 600° F., it's a premium product in every way—clean appearance, long life, high efficiency—and it's easy to fit so you save from the first with this better insulation. Made in standard, 1½", and 2" thicknesses for pipe sizes from ½" to 12" in half-rounds with jacket and metal bands. Your Unarco Distributor has Amocel. Call him or write for literature.

- UNHARMED BY MOISTURE, STEAM, OR FUMES
- LIGHT, STRONG—WITHSTANDS IMPACT AND VIBRATION
- MAY BE REMOVED AND REUSED REPEATEDLY WITHOUT DAMAGE OR LOSS OF EFFICIENCY

UNARCO

UNION ASBESTOS & RUBBER COMPANY

DEPT. A-7, 332 SOUTH MICHIGAN AVENUE · CHICAGO 4, ILLINOIS

UNARCO

Distributor of the Month

H. S. Chaffee Company, Inc.

220 SCOTT STREET

BUFFALO 5, NEW YORK

From two well-stocked warehouses in Buffalo and Syracuse, H. S. Chaffee Company serves Northern New York State with Unibestos, Amocel, and other Unarco thermal insulations.

For ten successful years, this progressive organization has promptly provided commercial and industrial users with expert engineering advice as well as reliable products.

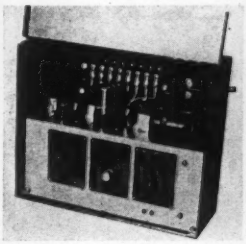
Write or phone the Chaffee Company when you need insulation assistance. In Buffalo, the phone number is WAshington 3142. In the Syracuse area, phone Liverpool 69-2241. The Syracuse office and warehouse are located on Liverpool Road, Liverpool, N. Y.

INDUSTRIAL Insulations

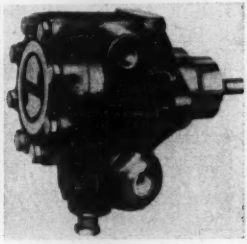
PRODUCTS OF

UNION ASBESTOS & RUBBER COMPANY

fan, the element is mounted either in the duct or the conditioned space, remote from the amplifier and adjustments. For spaces not completely air conditioned, the aspirating type control is available, with all operating adjustment mechanisms mounted in a cabinet.



Control



Pump

Two Stage Fuel Pump Unit

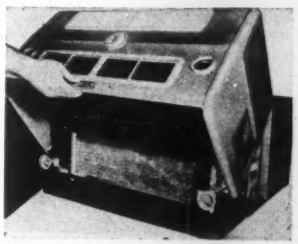
HPAC 20—Model H self purging, two stage fuel unit — Hydraulic Div., Sundstrand Machine Tool Co., Rockford, Ill. It pumps only solid oil to the nozzle, since the oil circuit automatically purges all air, the manufacturer states. The unit is designed for more convenient porting, has leak-proof valve construction, adjustable piston type valve for pressures from 75 to 150 psi, a large, easily removed strainer, new anti-hum diaphragm, and hydraulically equallized pumping members, according to the company. It may be interchangeably mounted with four other models. Units are available for 3, 6, 10, 14, and 20 gph firing rates, with strainer capacities of 6, 10, 15, and 20 gph. They are recommended by the manufacturer for two-pipe systems having vacuum requirements up to 20 in.

Perforated Metal for Filter, etc.

HPAC 21—Metal with baffle, or up and down, perforations for use as a filter, sound deadener, etc. — Erdle Perforating Co., 171 York St., Rochester, N. Y. When looked at directly, the metal shows no holes, since no metal has been removed. It may, therefore, be used on floors for return air to service a room. Since it is corrugated both ways, it has great strength, the manufacturer states. Used as a filter, the metal acts as a perforation with a high percentage of opening. It can be used to deaden sound on ceilings, provide for flow of cooled and heated air, break up and mix liquids, etc., and is available in any kind of metal and all regular size sheets.

Room Air Conditioner

HPAC 22**—"Quiet Kool" ½ hp room air conditioner redesigned so that the outer cabinet is the same size as for

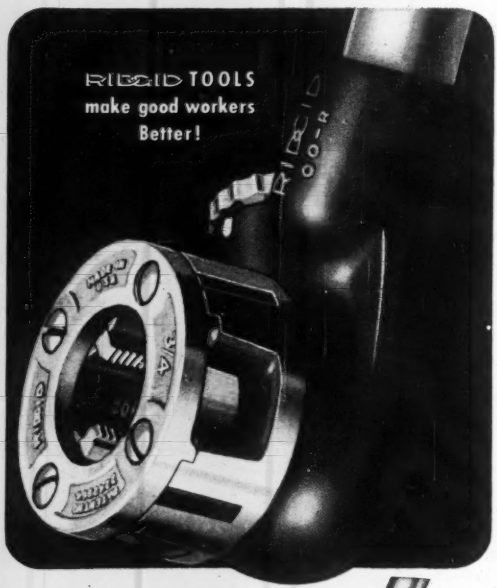


the ¾ hp model, facilitating change in sizes without completely new installation — Quiet Heet Mfg. Corp., 135

WHY SKILLED WORKMEN Prefer

RIDGID

Small Ratchet Threaders



Drop head sets to thread ⅛" to 2"

Extra Fast Easy Pipe Threading

RIDGID Bolt Dies 00R-B
¼" to 1", National Coarse and Fine Thread

★ Heads snap into ratchet ring from either side, won't fall out.

★ Precision-cut alloy dies reverse for close-to-wall threads—no special dies needed.

★ 00R & 0R, ⅛" to 1"; 111R and 11R, ⅛" to 1¼"; 12R, ⅛" to 2". Conduit dies available.

★ Buy at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

N. J. R. R. Ave., Newark 5, N. J. The cabinet is hinged, and control knobs are recessed so that the user can raise the housing to clean the metal air filter. A new arrangement of internal parts permits use of a silencing chamber which effects quieter operation. The base has been redesigned to permit use of a wider slinger ring in the condenser fan, providing sufficient condensate disposal on very humid days. A thermostat, an optional feature, can be controlled without unscrewing of the outer cabinet. The company has developed a new 1/3 hp unit this year.

Vertical Motors

HPAC 23—Types SCU-C and SCU-R single phase, hollow shaft, vertical motors with accelerating type relay for disconnecting the starting capacitors — U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54. The relay is similar to those used for years in hermetically sealed refrigerator units, and gives fast, clean contact break, the manufacturer states. The double break contacts are designed to assure long life. To avoid possibility of bearing grease working into the relay or foreign particles being blown into the contact points, the relay was designed into the split-type outlet box. The motors are available from 1½ to 5 hp, with speeds of 1800 or 3600 rpm.

Motor

Valve

Safety Relief Valve

HPAC 21—No. 46 safety relief valve, primarily a water relief valve designed to serve also for steam, should critically high temperatures occur in a hot water heating system — H. A. Thrush & Co., Peru, Ind. It is designed in conformance to the ASME code, according to the manufacturer, and carries a rated output of 282,500 Btu. The valve has a specially designed metal diaphragm, a ¾ in. inlet and 1 in. outlet, and a testing lever, and is factory set at 30 lb pressure, nonadjustable.

Brazing Alloy

HPAC 25—"Phos-Silver" copper-phosphorous-silver alloy for brazing of copper, brass and bronze — Westinghouse Electric Corp., Box 2099, Pittsburgh 30. Extreme fluidity and good wetting properties enable the alloy to penetrate tight-fitting joints instantly to form strong ductile bonds, the manufacturer states. It can be used with any of the common brazing methods, and is especially suited for applications where brazing temperatures are critical. On heavy sections that absorb large quantities of heat, its low brazing temperature (1225 to 1275 F) reduces brazing time. Typical uses are in assembly of refrigerating and air conditioning equipment, heat exchangers, plumbing installations, etc.

NEW MODERN EFFICIENT

CARNES

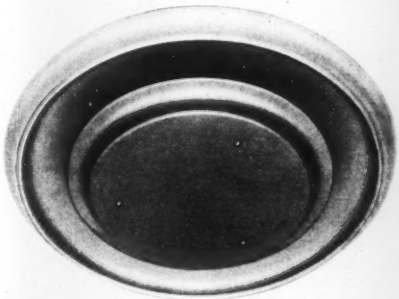
CIRCULAR CEILING DIFFUSERS

- MODERN DESIGN AND STYLING
- ADJUSTABLE FOR GREATER DIFFUSION EFFICIENCY
- COMPLETE RANGE OF SIZES
- DESIGNED FOR EASY INSTALLATION AND ADJUSTMENT
- QUIET IN OPERATION
- AVAILABLE IN SEVERAL FINISHES
- PRICED AMAZINGLY LOW

AVAILABLE IN TWO STYLES

TYPE BR ▶

A multi-vane diffuser that is completely adjustable for all air patterns from horizontal to vertical.



◀ TYPE CR

Adjustable for exact control of volume and air flow. Many new innovations make installation and adjustment extremely simple.

DISTRIBUTOR INQUIRIES INVITED

A few desirable territories are still available for aggressive distributors.

W. R. CARNES COMPANY,
Dept. D,
Verona, Wisconsin.

Please send Bulletin ☐ Type BR Ceiling Diffuser ☐ Type CR Ceiling Diffuser

NAME .....

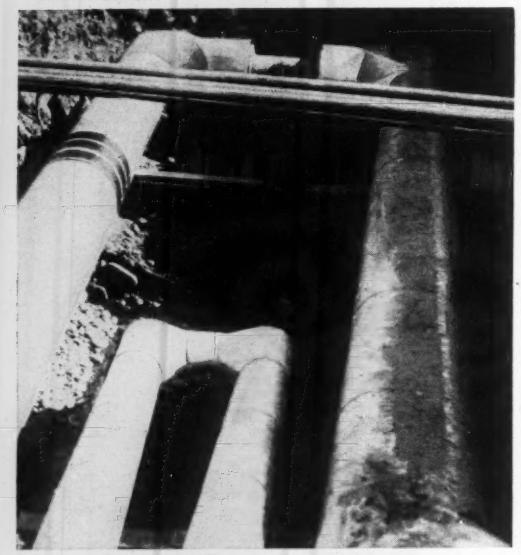
COMPANY .....

ADDRESS .....

CITY ..... ZONE .... STATE .....

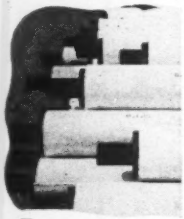
D.I.P.
REG. U. S. PAT. OFF.

Pre-Sealed Protection Built-In at Factory



- and Low Cost Installation Saves Time, Trouble and Work

Wherever you have a problem of conveyance of hot-water, steam or refrigerants, you can specify DURANT INSULATED PIPE with complete confidence in securing long range economy.



The combination of the best quality moulded insulation completely protected by non-porous asphalt merits the preference of architects, engineers, and contractors who have investigated the scientifically engineered construction methods employed in the fabrication of D. I. P.

Economy starts with installation. D. I. P. requires no tile, masonry, or sub-drains. Field joint work is simple, yet corrosion and electrolysis are eliminated. Low maintenance costs result in further economy over long years of dependable service.

Complete detailed information and engineering data on standard piping and special fittings will be furnished on request. Our representatives in principal cities are at your service.

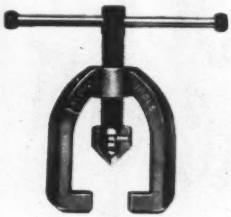
PRE SEALED
REG. U. S. PAT. OFF.

WESTERN DIVISION:
DURANT INSULATED PIPE CO.
1015 RUNNYMEDE STREET
PALO ALTO, CALIFORNIA

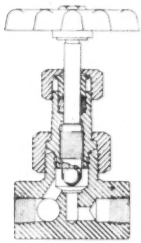
EASTERN DIVISION:
DURANT INTERNATIONAL CORPN.
WILLIAMSTOWN
NEW JERSEY

Flaring Tools

HPAC 26**—Heavy duty and standard model flaring tools with ball bearing swivel head — Talon Tools, North Arlington, N. J. The new head reduces friction and eliminates strain and cracks at the lip of the tubing being flared, the manufacturer states. Metal chips, dirt, and other foreign matter are pushed aside and cannot be ground into the flared surface. The tools are permanently grease packed and sealed at the factory.



Tool



Valve

Ball Valve for Shutoff

HPAC 27—¼ in. ball valve, for working pressures up to 3000 psi, providing shutoff by a stainless steel ball which closes into a machined, conical seat — The Foxboro Co., Foxboro, Mass. The ball, retained at the end of the stem, is free-rolling, so that every closing brings a new surface into contact with the valve seat. Alignment of ball to seat is piloted by a forged steel, union type bonnet, fitting tightly to the body. The packing is a preformed, graphited asbestos with a plastic binder and can be replaced without shutting off the line pressure. Straight through and angle types are available with two and four connections. Applications include meter manifolds, gage lines, seal chambers, and other uses in liquid, gas and steam service.

Gas, Oil Burner Programming Control

HPAC 28—"Fireye" programming control Type 26RJ8, designed to provide automatic starting and programming control for commercial and industrial gas, oil, and combination gas-oil burner equipment — Combustion Control Corp., 77 Broadway, Cambridge 42, Mass. It is used with the company's scanner to protect burner installations from hazards of flame failure. The control automatically starts a burner in operation and programs a sequence of prepurge, ignition-on, fuel valve delay, post-ignition timing, and post-purge. It provides complete fuel cutoff in 2 to 4 seconds, and a built in time delay prevents false shutdown from transient effects, the manufacturer states. Timing is accomplished through a high torque synchronous motor. The control operates on 115, 208 or 230 volts, 50 or 60 cycle current.

Sleeve Bearing Unit

HPAC 29—Self-eliminating flange sleeve bearing unit designed for light shaft duty and power take-off application on all types of sheet metal fabrications — Randall Graphite Bearings, Inc., 1011 S. Greenlawn Ave., Lima, Ohio. The flange mounting is made of 16 gage steel which is press-shaped to conform with the spherical ball assembly. This assembly is a cast-iron hollow ball in which an oil reser-

BARBER
COLMAN
venturi-flo®
CEILING
OUTLETS
A UNI-FLO PRODUCT
ENGINEERED AIR DISTRIBUTION
GUARANTEED PERFORMANCE
BARBER-COLMAN COMPANY
1228 ROCK STREET • ROCKFORD, ILLINOIS

TITUSVILLE
"WP" TYPE
FIREBOX BOILERS

Write today for Bulletin B-3030

Precision die formed, fusion-welded into a single-piece unit, the sturdy Titusville "WP" Boiler is designed in every detail to deliver long-lived, satisfactory heating and power service for exacting industrial and institutional requirements. ● Investigate the advantages for your application!

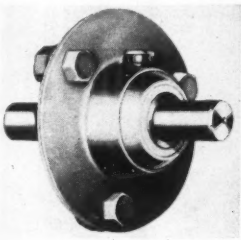
THE TITUSVILLE IRON WORKS COMPANY

A division of Struthers Wells

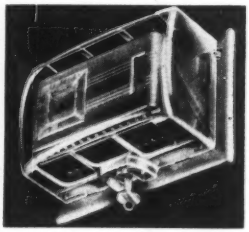
Representatives in Principal Cities

TITUSVILLE, PENNSYLVANIA

voir is formed when the bushing is pressed into place. The reservoir is packed with wool felt which becomes oil-saturated. Oil is fed to the bearing surface by the capillary action of the sintered bushing or the graphited bushing. Heat increases this action, providing self-lubrication. The bearing assembly measures 3½ in. in diameter x 1¼ in., and is available for five shaft sizes with sintered bushing, three with graphited bushings.



Bearing



Guard

Thermostat Guard

HPAC 30—Clear plastic guard, for electric clock thermostats, designed to prevent tampering — Minneapolis-Honeywell Regulator Co., 2641 Fourth Ave., S., Minneapolis 8. The clock and thermostat can be seen through the guard, and large openings on top and bottom permit flow of air into the control. The guard is equipped with lock and key.

Surface Pyrometer

HPAC 31—"Pyro" surface pyrometer for surface and sub-surface temperature measurements — Pyrometer Instrument Co., Inc., Bergenfield, N. J. It is available with a selection of 14 types of thermocouples and extension arms to meet various needs, and can be equipped with a quick-change connector which permits the thermocouples to be snapped and locked onto the extension arms rapidly. Thermocouples are interchangeable without adjustment or recalibration. The "Lock-Swivel" permits locking of thermocouples at any desired angle without danger of their jarring loose while the measurement is being made, the manufacturer states. The instrument is available in five different temperature ranges for laboratory and plant use.

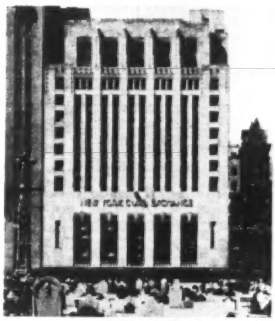
Pumps

HPAC 32—Self-priming and standard design turbine vane type pumps for pumping hot and cold, clear and vaporous liquid, in moderate capacities, against medium or high heads — Peerless Pump Div., Food Machinery and Chemical Corp., 301 West Ave. 26, Los Angeles 31. The Type TVE pumps are close coupled to face mount electric motors; Type TVB are flexible coupled electric drive pumps. Both lines are available with or without the self priming device. In these pumps, liquid enters the suction inlet, passes through the suction ports and is picked up by a single multi-vaned impeller. The centrifugal force imparted by the vanes throws the liquid into the channel.

CONTINENTAL AIR FILTERS PREFERRED

IN NEW YORK CITY, the air in many of the finest and the newest buildings is cleaned by Continental Air Filters. Pictured are just a few of the many New York buildings in which dependable Continental Air Filters are in service.

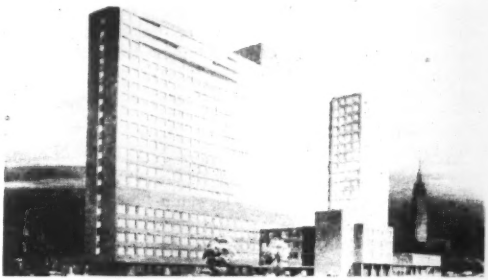
The story is the same from coast to coast. Whether in new buildings . . or for the improvement of fine, old buildings . . Continental Air Filters are preferred because of increased air filtering efficiency and lowered operating costs.



Building: NEW YORK CURB EXCHANGE, 86 Trinity Place, New York, New York. *Architect:* Starrett & Van Vleck. *Consulting Engineer:* Edward E. Ashley.

Building: 260 MADISON AVENUE, New York, New York. *Architect:* Sylvan Bien. *Consulting Engineer:* Sears & Kopf. *General Contractor:* Hegeman Harris Co., Inc. *Heating Contractor:* Eugene J. Brandt & Co., Inc.

Building: LEVER HOUSE—Lever Brothers Company, 390 Park Avenue, New York, N. Y. *Consulting Eng.:* Jaros, Baum & Bolles. *Architect:* Skidmore, Owings & Merrill. *Gen. Contractor:* George A. Fuller Company. *Heating & Ventilating Contractor:* Kerby Saunders, Inc.



Building: VETERANS ADMINISTRATION HOSPITAL, East 23rd Street, New York, N. Y. *Architect:* Alfred Hopkins & Associates. *Consulting Eng.:* Guy B. Panero. *Gen. Contr.:* Cauldwell-Wingate Company. *Heating Contr.:* Heating Maintenance Corp. of N. Y. Construction under direction of Corps of Engineers, New York District.

Building: MOUNT SINAI HOSPITAL—Atran Laboratories, Fifth Avenue & 100th Street, New York, N. Y. Alfred Rheinstein, chairman of building committee. *Architect:* Kahn & Jacobs. *Consulting Engineer:* Tenney & Ohmes, Inc. *Heating Contractor:* Alvord & Swift.

Building: NEW YORK LIFE INSURANCE COMPANY, 51 Madison Avenue, New York, New York. *Architect:* Cass Gilbert. *Consulting Engineer:* Meyer, Strong & Jones. *Heating & Ventilating Contractor:* Harold J. Ryan, Inc. (and)—The Frank A. McBride Company.

Building: TIFFANY & COMPANY, 727 Fifth Avenue, New York, New York. *Architect:* Cross & Cross. *Consulting Engineer:* Jaros, Baum & Bolles. *General Contractor:* Turner Construction Company.

Bldg.: HOTEL STATLER, 7th Avenue & 33rd Street, New York, New York.

For details or literature, without obligation, write

CONTINENTAL AIR FILTERS, INC.
Box 1647
Louisville 1, Ky.

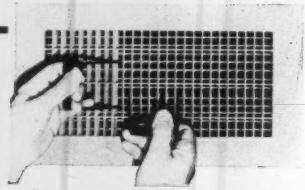
CONTINENTAL

TAMPER PROOF

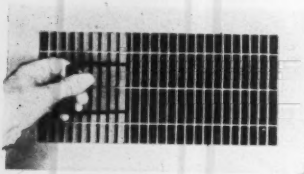
"Solid Bar"

Supply Grilles

Can Only be adjusted with special Adjusting Tool



STYLE — 320 Adjustable Horizontal and Vertical Bars



STYLE — 120 Adjustable Vertical Bars

These Interlocking Bar Type Grilles are essential where Quality, Safety, Ruggedness and Performance are the first consideration. Ideal for Schools, Institutions, Churches, Theaters and Public buildings. Close mesh prevents inserting fingers through openings. Heavy, round edge, bar type construction withstands tremendous abuse.

28 PAGE CATALOG

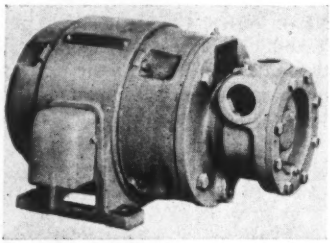
Features newest, different, comprehensive Performance Tables . . Write . . FREE

This Sign assures you Highest Quality Products

REGISTER & GRILLE MFG. CO., INC.

70 BERRY STREET, BROOKLYN 11, N. Y.

from which it is deflected into succeeding vanes of the impeller. This continually builds up pressure until the liquid reaches the stop which deflects it onto the discharge outlet. Hot water up to 250 F can be handled, and the pump



can handle liquids where a constant capacity is required, but where head conditions will vary. At 3500 rpm, capacity is up to 58 gpm and head up to 800 ft; at 1750 rpm, capacity is 56 gpm, head up to 300 ft. Motor sizes up to 20 hp are available at 3450 rpm, and up to 7½ hp at 1750 rpm.

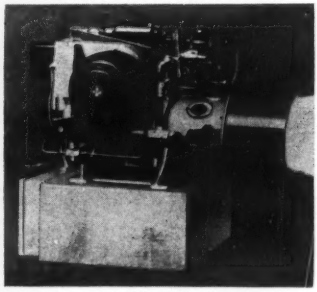
Radiator Units

HPAC 33**—"Flor-Line" radiator unit, for hot water heating, designed with six flattened tubes, with fins hydrogen-brazed to each tube — Hooper Engineering Co., 18215 Greydale, Detroit 19. According to the manufacturer, the construction brings 90 percent of the metal into contact with the air, and heat transfer time is reduced since heat travels less distance to reach the metal. Water is piped from a feeder line at 180 F, directly to each unit. Units are built as packages, ranging from 2 to 10 ft in length. They are 2 in. deep, 8⅞ in. high. When installed, they become a component part of the baseboard.

Synclinal Filters

HPAC 34*—Synclinal filters now adapted in all models for filtering water — Marvel Engineering Co., 627 W. Jackson Blvd., Chicago 8. The sump type is available in capacities of from 5 to 100 gpm, the line type in capacities from 5 to 50 gpm. Monel mesh sizes are from coarse 30 to fine 200. No changes have been made in the basic design. Line types still operate in any position and may be serviced without disturbing pipe connections.

Filter



Burner

Oil Burners

HPAC 35—Two new models in a line of industrial and commercial oil burners — Cleaver-Brooks Co., Hev-E-Oil Burner Div., 326 E. Keefe Ave., Milwaukee 12. Model

IN PLANNING *Your*

CONTINUOUS PROCESSES

INCLUDE

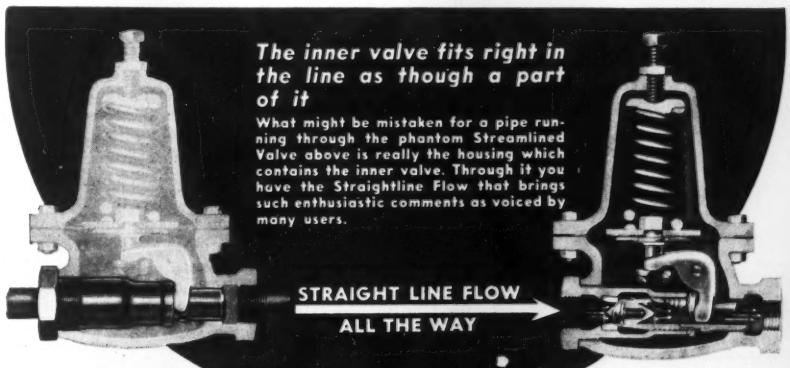
STRAIGHT LINE FLOW Valve Advantages

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE REDUCING VALVES

Streamlined flow of steam, air, oil, etc., around the inner valve is an immediate solution to the important need of dependable control under varying loads.

Continuous processes can be dependably protected against slow downs, failures, and maintenance ordinarily due to valve inefficiencies. The STREAMLINED "1000" Valve with ample capacity, tight closing characteristics, close delivery pressure control, and with a wide range of adjustment makes possible speedier production, smooth operation and no spoilage.

You get straight line flow which eliminates turbulence so that at all times you are easily able to meet peak demand and yet hold the reduced pressure constant at the same time. For the complete facts write for Bulletin "1000."



The inner valve fits right in the line as though a part of it

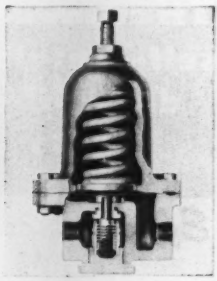
What might be mistaken for a pipe running through the phantom Streamlined Valve above is really the housing which contains the inner valve. Through it you have the Straightline Flow that brings such enthusiastic comments as voiced by many users.

STRAIGHT LINE FLOW
ALL THE WAY

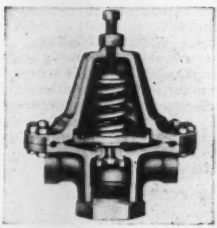
CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

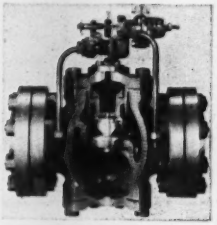
BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



High Pressure Reducing Valve Type H-P; extra heavy for use with initial pressures up to 5000 lbs.; and for reduced pressures up to 650 lbs. Good for most fluids. Sizes: ⅜" to 2"; bronze body; nitralloy trim. Get Bulletin 931.



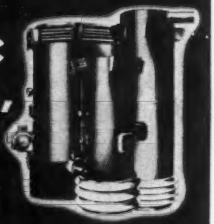
Type 887J Pressure Regulator for dirty liquids (like Bunker C fuel oil). Inner valve is bolted to diaphragm for positive movement. Sizes ½" to 10". Bodies: iron, bronze, or steel. Seat ring and inner valve; stainless steel. Bulletin 972.



Cash Standard Type 10 Pressure Regulating Valve, pilot operated. (Pilot operating fluid discharges to outlet pipe; not wasted). Sizes: 2" to 12". Highest pressures: inlet 600 lbs.; reduced 250 lbs. Iron, bronze, or steel bodies; standard trims. For water, air, non-corrosive gases and oils. Get interesting Bulletin 966.

a new idea in economical heating for industry

THERMOBLOC self-contained, direct-fired units

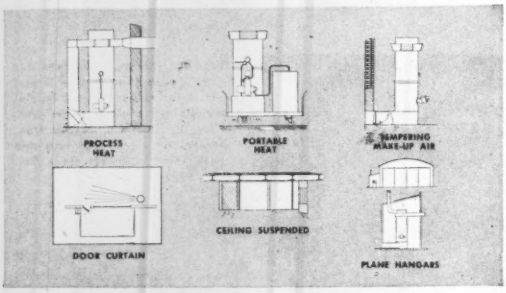


Efficient, controlled, low-cost heat!

Here's the answer to thousands of heating needs—the revolutionary new THERMOBLOC. Direct circulating heat from individual units keeps heated air moving in and around working areas. Has rugged, boiler-type construction. Easy to install, operates immediately on oil or gas. No complex piping, duct work or radiators. Units come complete or ready for simple assembly and prompt installation.

Installation costs as low as one-third, operating costs down to one-half of other types or methods. Perfect for large industrial plants, foundries, machine shops, bus terminals, warehouses and small or large commercial buildings, such as retail stores, skating rinks, gas stations, etc. Single units or combinations of any of the five sizes will meet any heating requirement.

Send for the data book. Contains tables and engineering data on heating constants, building materials, etc. Our engineers will help you on any heating problem. Mail the coupon today.



THERMOBLOC DIVISION
PRAT-DANIEL CORPORATION
5-7 MEADOW STREET S. NORWALK, CONNECTICUT
Manufacturers of P-D Power Equipment

Gentlemen:
Please send me the THERMOBLOC Data Book.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

AM5-H, with a capacity of 25 gph, has an overall width of 20 in., instead of 31 in. as formerly, facilitating side-by-side installations. The center of the combustion cone is now 8½ in. instead of 11 in., making it unnecessary to pit in front of the boiler on most jobs. It is lighter than the old model, and a switch panel box is now included. Model AM6-H, with maximum capacity of 40 gph, uses the same casting as the other new model, except that it has a 3 hp rather than a 2 hp motor, uses a larger oil pump, and has a larger dry oven and air diffuser.

Device for Signalling End of Zeolite Softener Run

HPAC 36—"Hydramizer", for signalling end of zeolite softener run, which takes a sample of the water, makes a soap test, and signals with red light if water is hard, green light if it is still soft — Refinite Corp., P. O. Box 1312,

Omaha 8. For automatic softeners, it actuates the automatic valves, and for selective automatic or manual units, it rings a bell to warn the operator that regeneration is necessary. The soap container must be filled occasionally, but no other routine maintenance is required, the manufacturer states.

Modulation Control for Room Air Conditioner

HPAC 37—Capacity adjusting device for automatically preventing a room air conditioner from overcooling when outdoor temperature drops — York Corp., York, Pa. A dial located on the cabinet of the unit permits the desired amount of cooling to be selected. After the conditioner is started, modulation control automatically adjusts the cooling capacity. When outside temperature drops, the control reduces the amount of cooling without changing ventilation or air circulation. If outside temperature rises, the control increases cooling until the predetermined comfort level is attained. In either event, the conditioner continues removing humidity. The device is an optional accessory for the company's ¾ hp room conditioner, and is standard on the 1 hp window type conditioner.

Solenoid Shut-off Valve

HPAC 38—"Midget" solenoid shut-off valve with time delay mechanism which holds back the flow of liquid or gas through the valve for approximately 5½ seconds after the solenoid becomes energized — Automatic Switch Co., 391 Lakeside Ave., Orange, N. J. This feature makes the valve particularly useful in oil burner applications where it is desirable to have instant combustion, the manufacturer states. The delay mechanism holds back flow of oil until

One Call for Your Metal Needs!

SAVE TIME AND TROUBLE WITH ONE-CALL BUYING FROM COMPLETE WAREHOUSE STOCKS OF ALL AVAILABLE METALS

Give yourself and your company the full benefit and big convenience of *"one-stop"* buying of metals from Metal Goods Corporation. You'll simplify metals purchasing a lot by calling on our nearest representative. You can rely on us to supply your requirements correctly, completely and quickly. We maintain seven well stocked warehouses and eleven sales service offices to serve your needs. Many metals users are making very profitable use of Metal Goods Corporation service. May we help you?

Please call, wire, or write the following Metal Goods Corporation representative nearest you.

OFFICES AND WAREHOUSES

St. Louis 15, Missouri
5239 Brown Avenue
Nelson L. Hower
Phone: GOodfellow 1234

Kansas City 16, Mo.
1300 Burlington
Frank D. Hogan
Phone: NOrday 3516

Tulsa 3, Oklahoma
302 North Boston
Scott J. Harrison
Phone: 4-1175

Houston 3, Texas
711 Milby Street
Harris T. Gregg
Phone: CEntral 8881

Denver 2, Colorado
2425 Walnut Street
Neal Dehn
Phone: AComa 5891

Dallas 9, Texas
6211 Cedar Springs Rd.
Sam D. Hodgdon
Phone: ELmhurst 3271

New Orleans 12, La.
432 Julia Street
Carl T. Wedemeyer
Phone: CAnal 7373

SALES SERVICE OFFICES

Wichita, Kansas
2200 East Central
Ray Noller
Phone: 7-8921

Jackson, Mississippi
781 Raymond Road
George E. Akerberg
Phone: 5-2711

Decatur, Illinois
1305 West Sunset
Arlie W. Tempel
Phone: 8-1314

Baton Rouge, Louisiana
4419 Mimosa Street
Paul P. Vidovic
Phone: 4-4738

Indianapolis 2, Ind.
1333 N. Pennsylvania
Harry L. Newton
Phone: Lincoln 4980

Memphis, Tennessee
713 Columbian Mutal Tower Bldg.
Robert W. Downs
Phone: 5-8721

Omaha, Nebraska
3515 No. 67th Avenue
C. M. Cooley
Phone: Walnut 1112

Beaumont, Texas
238 Bowie Bldg.
Lee T. Dodson
Phone: 4-7536, 4-7537

Fort Worth, Texas
3821 Carolyn
John M. Turbitt
Phone: FOrtune 4369

San Antonio, Texas
2012 Alamo Natl. Bldg.
Roy D. Bagaley
Phone: GArfield 3161

Davenport, Iowa
924 State Street
Robert L. Tharp
Phone: 2-3156

METAL GOODS CORPORATION

GENERAL OFFICES: ST. LOUIS 15, MISSOURI

how flexible CAN YOU GET!

WITH EXPANSION JOINTS IT'S **Badger**

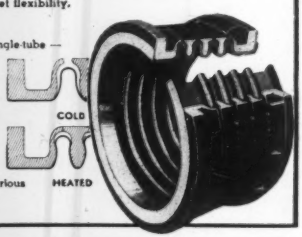
In the national pastime there are new stars every year — but when it comes to expansion joints Badger is a consistent leader in the field year in and year out.

The built-in flexibility and long life of Badger Expansion Joints assures protection against damage to equipment by absorbing the expansion and contraction in piping due to temperature changes.

D-F S-E Directed-Flexing Self-Equalizing: an exclusive feature of Badger Expansion Joints. The flexing of the corrugations is progressively directed over each segment of each of the all-curve corrugations by correspondingly shaped self-equalizing rings. Localized stresses are eliminated insuring a more flexible longer lasting joint.

Buy Badger Joints and you get flexibility, D-F S-E and these features:

- Packless . . . pressure-tight single-tube — requires no maintenance
- Compact . . . approximately the size of flanged fitting
- Special forming . . . no structure-weakening stresses
- Controlled heat treating . . . assures long life
- Wide range of traverse — pressure — temperature Fabricated from deoxidized copper, stainless steel and special alloys to meet various operating conditions.



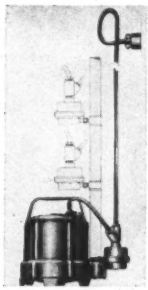
BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE • MASS.

a full stream of air, sufficient to make a good combustible mix, is flowing through the burner. On subsequent stoppage and re-lighting, the delay gives sufficient time to purge the fire box of old fumes and smoke. The valve can be installed in any position without affecting the time delay action. Shutoff is instantaneous. Overall size, top to bottom, is 2 13/16 in. The valve has ⅛ in. pipe connection and full 1/16 in. port for pressures up to 150 lb with 15 gph flow. Standard continuous duty coil is for 115 volt, 60 cycle current.

Valve


Pump

Submersible Switch and Pump

HPAC 39—Switch, for use with the manufacturer's submersible pump, to provide automatic control of the water level at which sump and circulating pumps will turn on — Kenco, Inc., 1125 N. Ridge Rd., Lorain, Ohio. If a sump is small with a constant flow of water entering, the switch can be placed as high as necessary on the discharge pipe to keep the number of cycles to a minimum. Otherwise, the pump operates too frequently. The same method can be used for sump pumps or circulating pumps where it is desirable to pump a tank or sump dry after letting it fill to a desired height. If some liquid is to remain in the tank or sump, the company's pump can be placed on blocks to raise it to the required height. This affords precision control, good operation being assured by the submersible switch which has no exposed electrodes or floats to corrode or stick, the manufacturer states. Capacities of the company's pumps are up to 3300 gph at 10 ft head.

Oil Burner

HPAC 40—Model TMJ oil burner, with capacity of 6 to 12½ gal, now available with 6 in. extension, permitting burner to be installed in large boilers and allowing fire door to be open for flame inspection — Electrol Burner Mfg. Co., Inc., 22 Union Ave., Rutherford, N. J. This semi-commercial burner will be furnished with a double extended cutoff valve with a monel needle seating directly in back of the dual nozzles. This construction, in conjunction with the magnetic valve provided, insures instant cutoff on burner shutdown and prevents after-drip of oil and carbonization of the nozzles, according to the company.

Electronic Timer

HPAC 41—Type 30HL1 electronic timer which provides four basic types of timing (interval, delayed action, automatic repeat, and programming) as well as variations of these, in process control, machine timing, and other industrial applications — Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass. All timing combinations are incor-

ASK THE AEROFIN MAN

For the Practical Answer to Your Heat-Exchange Problem . . .

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.

AEROFIN CORPORATION

410 South Geddes St., Syracuse 1, N. Y.

Why This Trade-mark means Quality in the Heating Business

Fifty years ago one of the Founders of Barnes and Jones introduced the first vapor system with modulating valves. Through the years, the accumulation of experience in vapor and vacuum systems, and the know-how of manufacturing equipment which will stand up through many years of service, has earned the slogan "Barnes and Jones Means Quality."

In addition to the known service record, Barnes and Jones is a progressive company. B & J developments include the perfection of reliable temperature controls for both vapor and vacuum systems; methods of automatic soldering and high frequency welding of the important thermostatic diaphragms, and light weight float and thermostatic traps that can be installed close to the ceiling with fewer supports.

And as a final proof that B & J Quality is accepted, the company is moving into a five story plant which already has many new and most modern machines in operation.

REPLACEMENT UNITS

One of the most appreciated products of B & J is the Cage Unit which will replace the entire internal mechanism of any other trap housing. You don't even use the old valve seats—and the unit is factory adjusted. There is nothing to do but grab a wrench, test your traps with the B & J testing set, and replace the bad ones with the B & J Cage Unit. Ask for the Bulletin—"Heating Magic." It will save time and money and do away with most of your heating system complaints.

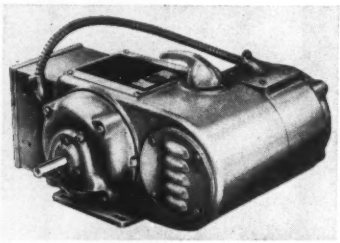
1-A

for QUALITY
Barnes & Jones
INCORPORATED
REPRESENTATIVES IN PRINCIPAL CITIES
BOSTON 30, MASSACHUSETTS

porated, and may be used by changing the external connections to the terminal board. This is an automatic timer for intervals from 1/20 seconds to 4 minutes, and is said by the manufacturer to afford unusual flexibility combined with great accuracy and long-life dependability. The circuit is self-compensating for changes in line voltage. Only one vacuum tube and one relay are employed. Power supply is 115 or 230 volt, 50 or 60 cycle current.

Variable Speed Motor

HPAC 42—Type VA-C "Varidrive" single phase variable speed motors, in fractional horsepower, permitting use of 110 or 220 volts — U. S. Electrical Motors Inc., Box 2058, Los Angeles 54. Available in ¼, ⅓, ½, and ¾

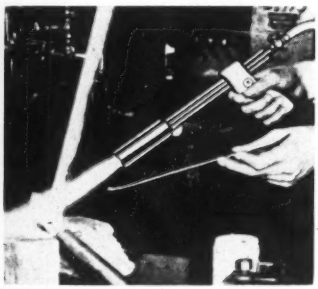


hp. the motor provides speeds in a 10:1 ratio with the range from 4 to 10,000 rpm. A control dial is turned to change the motor's speed, eliminating the need for an external speed changer or gear box. The motor occupies little more room than a standard fixed speed type, according to the manufacturer.

Flow Rate Regulator

HPAC 43—Improved flow rate regulator for blending and proportioning, solvent extraction, water treatment, and other applications where liquids are handled — W. A. Kates Co., 430 Waukegan Rd., Deerfield, Ill. The calibrated dial is set to the desired flow rate, and despite pressure fluctuations in either the inlet or outlet lines, flow is held automatically to the set rate. When combined with a centrifugal pump, the regulator gives excellent proportioning control, the manufacturer states. It is available in standard capacities from 0.1 to 100 gpm, and is accurate to within plus 3 percent, according to the company. Installation requires no special tools.

Regulator



Torch

Heavy Duty Torch

HPAC 44**—No. 336P "Torchmaster Bazooka" heavy duty burner with self-cooled, adjustable, pistol grip handle

Best Solution

to Industrial Ventilating, Heating and Cooling Problems

ANEMOSTAT
Type HU-4 Air Diffusers equipped with these 3 accessories
offer controlled pattern and volume

① Selected quantity of air is sliced from main air supply and turned into takeoff.

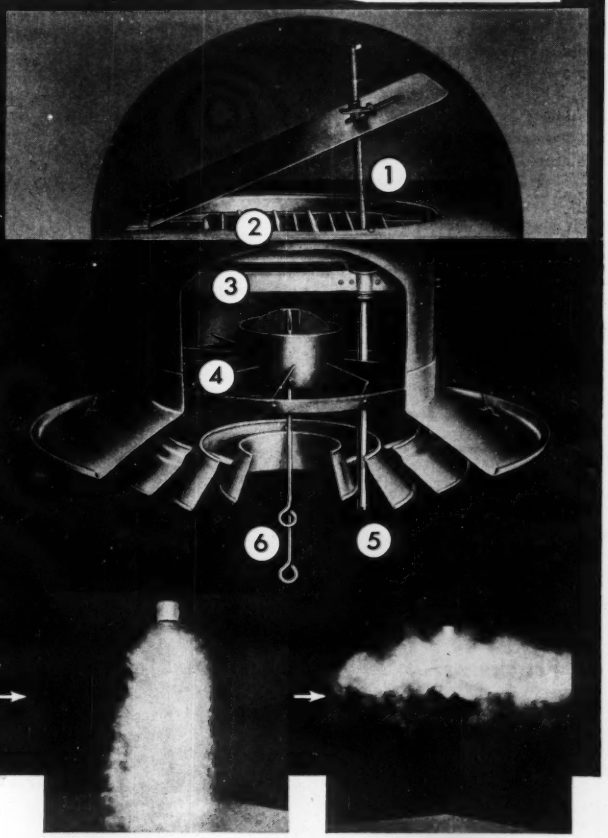
② Multiple vane deflector straightens flow of air and equalizes flow in takeoff.

③ Rugged brace rigidly holds volume damper without vibration.

④ Radial vane deflector distributes air evenly over the expanding cones of the *aspirating* diffuser.

⑤ **ADJUST VOLUME** by turning this rod with screw driver.

⑥ **CHANGE PATTERN** by pulling diffuser rod.



ADJUSTABILITY FROM VERTICAL TO HORIZONTAL

No drafts—no special tools—no wasted time—no ladders—no accidents—no labor complaints.

Large range of sizes to handle from 1,000 cfm to 15,000 cfm per unit.

Specify Anemostat HU-4 Diffuser complete with Splitter Damper, Equalizing Deflector and DE-2 Radial Deflector.

ANEMOSTAT®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA
10 EAST 39th STREET, NEW YORK 16, N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

"No Air Conditioning System Is Better Than Its Air Distribution"

AC 1891

which can be moved close to the burner for better control, or away from the reflected heat of the work — Industrial Engineered Products Co., 7416 Melrose Ave., Los Angeles 46. Designed for use in hard-to-reach locations where heavy heat concentration is needed, it may be used in such applications as preheating and annealing, rebabbitting bearings, melting out leaded soil pipe joints, etc. It weighs 2½ lb, complete with hose assembly, and produces a flame range from 5 in. long and 1 in. diameter to 20 in. long and 5 in. diameter. It operates from standard liquid petroleum gas (Butane-Propane) cylinders at tank pressure with no gas regulator required.

EQUIPMENT BRIEFS

"Solaramic" process of *CERAMIC COATING FOR METALS* to extend their life in high temperature use — Solar Aircraft Co., 2200 Pacific Highway, San Diego 12. Industrial applications of coated parts are unit heater components, oil burner parts, industrial bellows, thermocouple components, processing equipment and heat exchangers.

Heavy-duty, high temperature *OIL BOOSTER*, a self-contained, fully automatic heating unit operating on the principle of a closed heating system, vented to atmosphere — Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12. It is always at atmospheric pressure, and pressure developed by the circulating pumps is considered sufficient for most installations. A tight coil system guarantees a negligible loss of heat transfer oil through evaporation, the company states. The unit is fired by a pressure atomizing type of oil burner suitable for oil having a viscosity not exceeding 50 seconds Saybolt Universal.

Aircraft size *TUBE BENDER* designed to occupy 30 percent less floor space than former units — Pines Engineering Co., Inc., 601 Walnut St., Aurora, Ill. The operating circuit permits individual control of all functions at any time during the cycle. It will handle stainless steel tubing 1 in. — 16 gage, IPS extra heavy pipe up to ¾ in., and non-ferrous metals 1¼ in. — 0.134 wall, as well as extruded shapes within its capacity range.

"Liquid Awning" *PLASTIC PAINT* which contains aluminum as a pigment, and is painted on windows which face the sun to reduce the amount of heat passing through — International Products Corp., P.O. Box 118, Trenton 1, N. J. It peels off for removal in winter time.

"Venus" *DRAWING PENCILS*, a combination yellow and vermilion blue print marking pencil — American Lead Pencil Co., Hoboken, N. J. The colors are nonfading and waterproof.

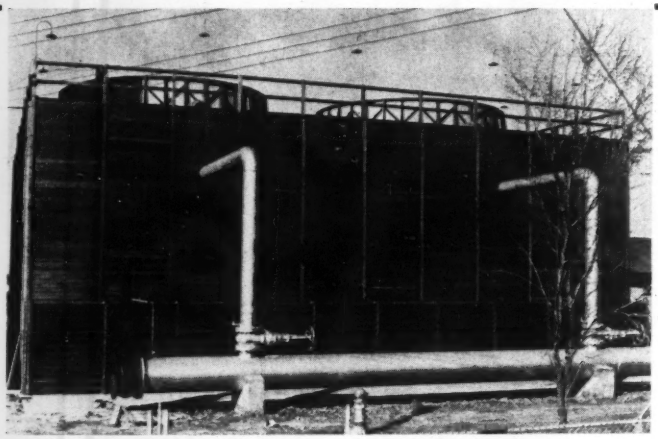
"Arcosil" No. 2184 *SILICONE RUBBER IMPREGNATED FIBER GLASS MATERIALS* for ducting, sleeves and couplings requiring resistance to high and low temperatures — Silicone Dept., Arrowhead Rubber Co., Downey, Calif. Items manufactured from this material withstand temperatures as high as 700 F; remain flexible at —125 F; and resist aging, ozone and most corrosive fluids and gases, the manufacturer states.

Air-operated *AUTOMATIC PIPE AND TUBE CUTOFF MACHINE* designed to cut up to 60 pieces of 12 in. pipe and tube per hr. and smaller sizes proportionately faster — Continental Machine Co., 1952 N. Maud Ave., Chicago.

Modern UNITED Towers Serve All Fields

Power

Petroleum



Gas

Refrigeration

United Cooling Towers provide low cost water cooling for a wide range of industrial and commercial operations. All types are included . . . . featuring low head distribution, redwood interiors, wood, transite or masonry casings. Full details in Bulletin No. 50. Write for it today.

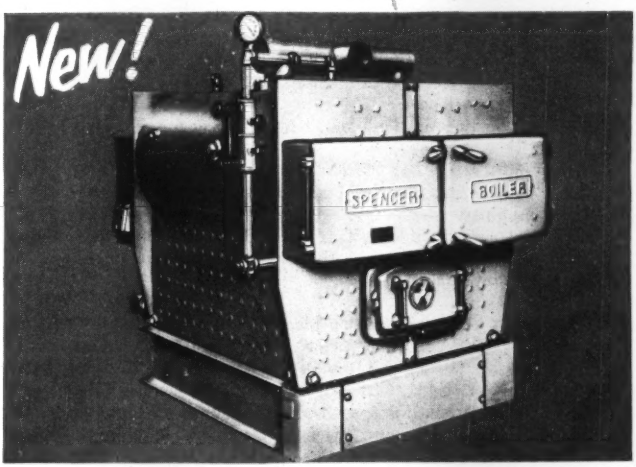
UNITED COOLING TOWER COMPANY

Porter Bldg. Authorized Representatives in Principal Cities Kansas City 2, Missouri Plant: Pilot Point, Texas

Let SPENCER Solve Your Heating Problems

with a wide selection of boilers in more than 70 adaptable models and sizes. There's a Spencer for every building... for every fuel!

IN THE COMMERCIAL FIELD, Spencer offers an ingenious new design like this—



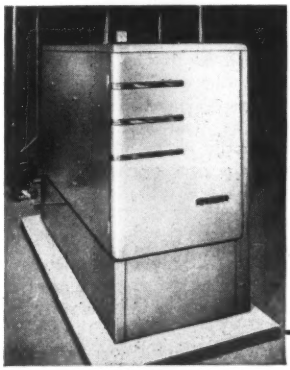
SPENCER'S
NEW DIVIDED LOW-WATERLINE BOILER

Flattened out to beat low headroom problem!

Divided for easier entrance through basement openings. Yet two watertight sections need no welding for installation!

This and other Spencer commercial boilers range in size from 3,500 to 42,500 square feet, steam.

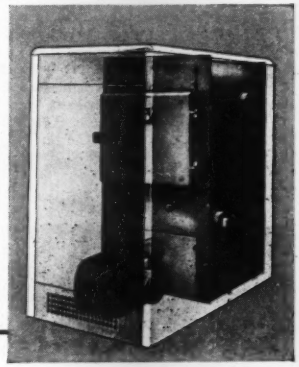
IN THE RESIDENTIAL FIELD, Spencer offers versatile lines like these—



SPENCER'S "C" SERIES—Modern steel heating boiler—smartly styled jacket, standard or extended—9 sizes ranging from 570 to 3000 sq. ft., steam—three-pass type boiler—heavy-duty doors—water-cooled frames.

SPENCER "R" SERIES—Steel heating boiler—6 sizes ranging from 320 to 1100 sq. ft., steam—peaked firebox for more efficient combustion—staggered boiler tubes for quick heat transfer—comes in standard or extended beauty jacket.

SPENCER HEATER
LYCOMING-SPENCER DIVISION
WILLIAMSPORT PENNSYLVANIA



New! AMAZINGLY POWERFUL!

INDUSTRIAL AIR

TUBEAXIAL | VANEAXIAL

FANS

TUBEAXIAL FAN

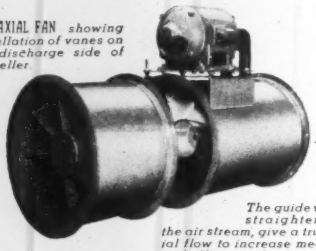
Designed for system ventilation.

May be connected to inlet or outlet duct, or both, as the installation may require.

For mounting at the inlet end of a duct the unit should be equipped with a streamlined orifice ring.

The new Industrial Air Tubeaxial and Vaneaxial fans produce high pressure air flow far beyond the capacity range of standard blowers. They are Industrial Air's answer to your tough exhaust problems. Produced after years of research. Provide greater economy in every way . . . COST, INSTALLATION, OPERATION AND MAINTENANCE. Delivers air against heavy pressure.

VANEAXIAL FAN *showing installation of vanes on the discharge side of propeller.*



The guide vanes straighten out the air stream, give a true axial flow to increase mechanical efficiency by converting waste energy to useful work

Installation of an Industrial Air Tubeaxial or Vaneaxial fan is as simple as replacing a duct section and requiring no more space. The noise factor is far below the decible rating of any comparable equipment. Available to your job needs and specifications, either direct or belt driven units, sizes from 12" to 48", motors from 1/6th H.P. to 50 H.P., Static pressure up to 4", 1000 to 65,000 C.F.M.

Represented in all principal cities

Write DEPT. 711 for complete catalog

THE HARVEY P. BERTRAM CO.

1008 W. Ninth St. Cincinnati, Ohio

WE HEAR THAT . . .

KEWANEE BOILER CORP. and *ROSS HEATER & MFG. CO., INC.*, two divisions of American Radiator & Standard Sanitary Corp., combined last month to form a new company, *KEWANEE-ROSS CORP.* Both units of the new corporation will continue to operate as before, maintaining their respective plant locations, sales offices and representatives. However, the unification of the management, personnel and facilities of the two firms "will provide a substantially broader scope of operations than was possible heretofore, enabling a wider range of related products and services." *CHARLES H. CURRIER*, formerly president of Ross, has been named chairman of the board of directors of the new organization. *W. BRADFORD RUSSELL*, formerly president of Kewanee, is president of the new firm.

DOLLINGER CORP., Rochester, N.Y., in line with its new expansion policy, is acquiring all the patents, tools, and inventory for the manufacture of the "Raytheon" electronic air filter for industrial and domestic air conditioning units, from Raytheon Mfg. Co., Waltham, Mass. The company also has purchased the three-story Simpson-Walter Lens Co. plant at 3 Circle St., Rochester, containing 60,000 sq ft of space. The company's home plant will be remodeled to provide enlargement of offices and the engineering and research departments.

MIDWEST PIPING AND SUPPLY CO., INC., St. Louis, has just completed an addition of 18,000 sq ft of floor space to the welding fittings manufacturing plant. This more than doubles the company's pressing and welding capacity, and with equipment, the structure represents an investment of $500,000.

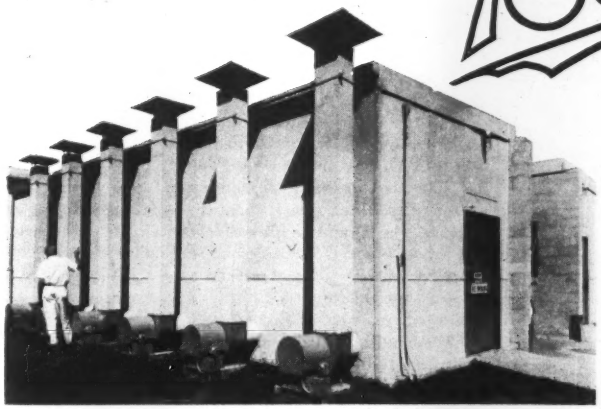
A new $1 million plant has been built for *J. O. ROSS ENGINEERING CORP.*, manufacturer of industrial air heating and air conditioning systems, at Highland Park, N.J., by H. K. Ferguson Co. The plant has 75,000 sq ft of production space and 4000 sq ft of office space, as well as a laboratory. The laboratory has units large enough to duplicate regular industrial conditions.

C. A. DUNHAM CO., Chicago, recently held its fifth consecutive two-week sales seminar at Purdue University Center in Michigan City, Ind. The company's sales engineers, wholesalers and other personnel heard about design changes and new products.

TEXSTEAM CORP., Houston, a division of *VAPOR HEATING CORP.*, will handle sales of "Texsteam" safety valves, chemical injection pumps, "Vapor-Clarkson" steam generators and other products. Up to now, "Texsteam" products have been used primarily in the oil production industry. With this change, the company is expanding sales to other industries.

Increase in space recently acquired by *U. S. ELECTRICAL MOTORS, INC.* amounts to an additional 40 percent of shop and office area in Los Angeles. While administration headquarters remain at the principal plant, four other buildings have been leased within a radius of one mile, to facilitate manufacturing and servicing procedures.

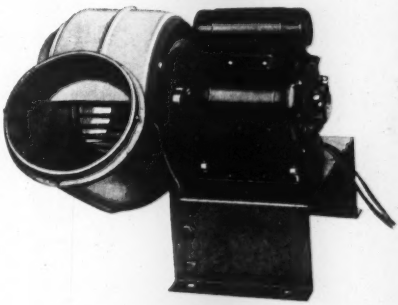
How Bayley Individual "Packaged Unit" VENT SETS Solved The Fume Exhaust Problem For Latest Scientifically Designed Drug Laboratory



EQUIPMENT-WISE designers of the Wm. S. Merrell Co.'s new organic research laboratory turned to BAYLEY for fan apparatus to remove explosive and noxious fumes from each of the twelve work booths in this unique "blow-out" proof structure. 100% outdoor filtered and tempered air is supplied to each booth. All of these cubicles have individual BAYLEY Exhaust Fans and stacks installed at ground level on the outside, each exhausting 1670 cfm, or a total of 20,000 cfm for the entire building. BAYLEY Type F Direct-Driven Vent Sets were specified for their proven efficiency in widely diversified applications. The ventilating contract was placed with the firm of Henry Niemes, Inc.

BACKED BY OVER 50 YEARS of specialized air handling experience, BAYLEY Equipment has the complete confidence of leading architects, engineers, contractors, and owners. With a BAYLEY Representative in principal cities, your requirements are assured the promptest of service.

WRITE TODAY for your copy of the new BAYLEY Vent Set Bulletin



BAYLEY Type F Direct Driven Vent Set

Bayley *Engineered Air Handling Equipment*

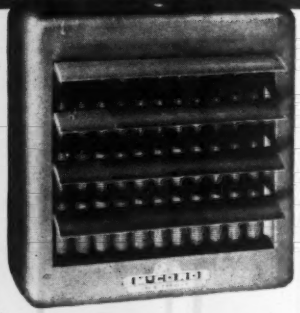
BAYLEY BLOWER COMPANY

6600 W. BURNHAM ST. MILWAUKEE 14, WIS., U. S. A.

McCORD

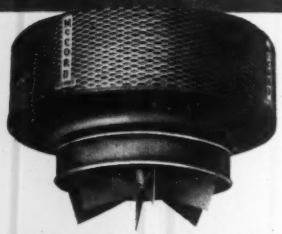
HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS



Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

VERTICAL TYPE UNIT HEATERS



A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

F. E. WINSTEL CO., Cincinnati distributor of heating equipment, has moved to larger, more modern quarters at 855 Poplar St.

The third annual seminar in industrial instrumentation will be held for professors of engineering in Philadelphia, August 18 to 22, by the Industrial Div., *MINNEAPOLIS-HONEYWELL REGULATOR CO.* The company's Valve Div. has established a research center in Philadelphia, with a hydraulic laboratory for measuring valve capacities. The center is housed in a two-story brick building.

J. H. WILLIAMS & CO., Buffalo, recently held a three-day sales conference which was attended by over 50 sales representatives from all sections of the country and Canada.

A 16 mm color sound motion picture on modern school planning, *Design for Learning*, produced for *HERMAN NELSON DIV.*, American Air Filter Co., Inc., Moline, Ill., has just been released for screenings to architects, consulting engineers, school boards, and other interested groups. The 25 minute film depicts an architect explaining to a school board the heating and ventilating system he has specified. Color shots of several new school projects in various states highlight the film.

An operating instruction school for its customers was held recently by the Kathabar Div., *SURFACE COMBUSTION CORP.*, at the Commodore Perry Hotel, Toledo, Ohio. Forty men representing 25 companies from various parts of this country and Canada attended.

JOHN L. HOLLOWAY, president, *CRANE CO.*, Chicago, is among the business executives who have been featured recently in a series of articles on *How Men at the Top Won Their Place*, appearing in the Chicago Tribune every Saturday.

OLIN INDUSTRIES, INC., East Alton, Ill., has acquired *RAMSET FASTENERS, INC.*, Cleveland, manufacturer of powder-actuated industrial tools. Ramset will continue its business under its present management, and will be operated under its present president as a part of Olin's Arms and Ammunition Div.

A 35 mm, black and white, sound slidefilm and allied literature on *Selection and Application of Fractional Horsepower Motors* has been announced by *GENERAL ELECTRIC CO.*, Schenectady, N.Y. It is an addition to the company's motor selection course, a training program launched last year.

THE BABCOCK & WILCOX CO., New York, has opened new headquarters in the recently completed 32 story, fully air conditioned Chrysler Building East, at 161 E. 42nd St.

A new method of fusing metals, designed to practically eliminate the use of complex machinery and tools for brazing, and to produce a superior weld, has been developed by two workers at *GENERAL CONTROLS CO.*, Glendale, Calif. The men, *DEAN CANTRALL* and *CHARLIE JOHNSON* will earn a large cash bonus, made possible through the company's employee suggestion plan.

Represented by
people you know . . .

SALES OFFICES

Albany, New York, F. R. Foote Co., Inc.
Albuquerque, N. M., Boyd Engineering Co., Inc.
Amarillo, Texas, Snook & Aderton, Inc.
Atlanta, Georgia, Crawley-Gorbant Co.
Baltimore, Md., Lancaster, May & Co.
Billings, Mont., Sullivan Valve & Engr. Co.
Binghamton, N. Y., Dudley W. Gregg
Birmingham, Ala., S. C. Bratton
Boston, Mass., L. R. Geissenhainer
Bridgeport, Conn., Augur, Jones & Green
Buffalo, N. Y., Van Ness Harwood Co.
Butte, Mont., Sullivan Valve & Engr. Co.
Charleston, W. Va., Engineering Products Co.
Charlotte, N. C., Robert E. Mason & Co.
Chicago, Ill., Zintel, Byfield & Co.
Cincinnati, O., Russell R. Gannon Co.
Cleveland, Ohio, Dan B. Billington
Columbus, Ohio, Russell R. Gannon Co.
Corpus Christi, Texas, L. S. Pawkett & Co.
Dallas, Texas, W. E. Lewis and Co.
Davenport, Iowa, Daniel C. Murphy
Dayton, Ohio, Russell R. Gannon Co.
Denver, Colorado, E. P. Murr
Des Moines, Iowa, Daniel C. Murphy
Detroit, Mich., George Q. McNamara, Inc.
El Paso, Tex., Boyd Engineering Co.
Fort Wayne, Ind., Jones Engineering Prod.
Great Falls, Mont., Sullivan Valve & Engr. Co.
Hammond, Ind., Zintel, Byfield & Co.
Houston, Tex., Jack Thomas Davis
Indianapolis, Ind., Russell R. Gannon Co.
Kansas City, Mo., Manufacturers' Sales Co.
Little Rock, Ark., J. C. Lewis Company
Los Angeles, Cal., Hess, Greiner & Polland
Louisville, Ky., Russell R. Gannon Co.
Lubbock, Tex., Snook & Aderton, Inc.
Memphis, Tenn., J. B. Lammons
Miami, Florida, Stuart G. Pizie
Milwaukee, Wis., Zintel, Byfield & Co.
Nashville, Tenn., S. C. Bratton
Newark, N. J., John B. Hewett Co., Inc.
New York, N. Y., John B. Hewett Co., Inc.
Norfolk, Va., Laurence Trant & Co.
Oklahoma City, Okla., J. M. O'Connor Co.
Omaha, Nebraska, D. E. McCulley
Peoria, Ill., Zintel, Byfield & Co.
Philadelphia, Pa., George F. Bertrand Co.
Phoenix, Ariz., Boyd Engineering Co., Inc.
Pittsburgh, Pa., E. J. Deckman Co.
Portland, Maine, A. E. Wallgren
Portland, Ore., T. C. Langdon Co.
Rochester, N. Y., A. R. Bowman Co.
Rockford, Ill., Zintel, Byfield & Co.
St. Louis, Mo., Myers Engr. Equipment Co.
St. Paul, Minn., Thermal Co., Inc.
Salt Lake City, Utah, Williams, Gritton & Wilde
San Antonio, Tex., L. S. Pawkett & Co.
San Francisco, Cal., E. C. Cooley Co.
Seattle, Wash., E. H. Langdon Co.
Spokane, Wash., Sullivan Valve & Engr. Co.
Toledo, Ohio, Eyster Engineering Co.
Tulsa, Okla., J. M. O'Connor Co.
Washington, D. C., Lancaster, May & Co.
West Hartford, Conn., Augur, Jones & Green
Wichita, Kansas, J. M. O'Connor Co.

Let's Face the Facts About Activated Carbon for Odor Removal

In government and private laboratories it has been fully established that activated carbon will remove odors by adsorption. So practical buying boils down to type, quality and amount of carbon to do a job properly.

THESE ARE THE VITAL CONSIDERATIONS

1. Carefully-controlled, gas-adsorption tests prove without question that carbon made from coconut shells has the greatest adsorptive power . . . far above coal carbon and other wood carbons found in some installations. Actually in our laboratories we have tested more than 15,000 different carbons. Activated, coconut-shell carbon stood out. Otherwise, why bring coconut shells from half-'way around the world?

2. Activated, coconut-shell carbon comes in various degrees of activation. A full, 50-minute carbon is most efficient. That is a coconut-shell carbon, a small quantity of which holds up under severe testing with a highly potent gas for a grueling 50 minutes . . . the equivalent of many, many months of ordinary, odor-removal service. ACSC* is such a carbon.

3. Finally, the amount of carbon is vitally important, for the carbon alone does the job of removing odors. So, in comparing similar equipment, check to see which has the most carbon with the least air resistance.

To sum up, be sure you are buying *50-minute* ACSC* in sufficient amounts to do your odor-removal job.

Pur Air is the *only* manufacturer that both produces Activated, Coconut-Shell Carbon and builds the containing-equipment, too. That makes for real quality-control.

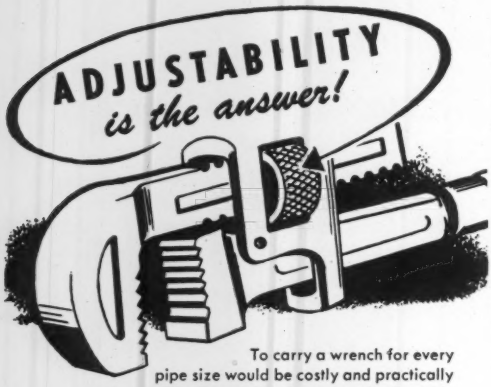
And 32 years of producing gas-adsorbent carbons provide the "know-how". If you have an odor problem, call on us.

*ACSC — activated, coconut-shell carbon.

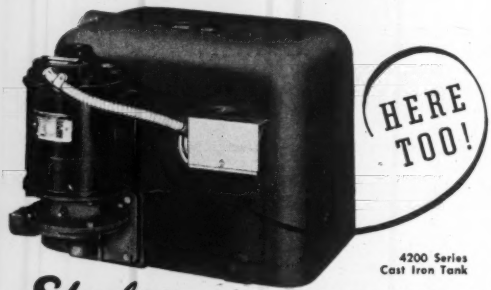
Pur Air

a division of **AMERICAN SOLVENT RECOVERY CORP.**
710 N. CASSADY
COLUMBUS 3, OHIO

WORLD'S LARGEST PRODUCER OF GAS-ADSORBENT CARBONS



To carry a wrench for every pipe size would be costly and practically impossible. Especially when several adjustable pipe wrenches will take care of most of your needs. That's the sensible answer to a very ordinary problem.



4200 Series Cast Iron Tank

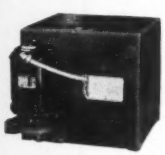
Sterlco CONDENSATION PUMPS

√ EASY to SELECT √ CONVENIENT to STOCK

Yes, only two sizes are required to take care of all jobs up to 15,000 sq. ft. EDR . . . and up to 20 lbs. discharge pressure. The adjustable float switch — so simple to set at required position — plus other Sterlco features make this possible . . . and only possible with a Sterlco Pump.

For you . . . this means less working capital tied up in floor stock. *For your customers* . . . this means that a future increase of radiation may not necessitate the installation of a new pump.

Combine this exclusive Sterlco feature with overall rugged construction and low cost and you find the reason Sterlco PUMPS are first choice of the industry. Yes, Sterlco will always do a better job . . . longer! Send for complete information on Sterlco Pumps.



Sterlco 4100 series for jobs where steel tank is preferred — same features as 4200 series.

STERLING, INC.

3732 N. Holton St., Milwaukee 12, Wisconsin

CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS

WHO'S WHAT

A. O. VOGEL, vice president, The Vilter Mfg. Co., was elected president of the *AIR CONDITIONING & REFRIGERATING MACHINERY ASSOCIATION* at its recent Hot Springs, Va., meeting. Other officers elected were *M. M. LAWLER*, Worthington Corp., first vice president; *A. J. DeFINO*, Fedders-Quigan Corp., second vice president; and *G. A. HEUSER*, Henry Vogt Machine Co., treasurer. The three-day meeting was marked with optimism as to the near-term outlook for sales of the industry's products, particularly of the heavier types of equipment.

JOHN A. HELLIESEN has joined *THE ALSTROM CORP.*, New York, as vice president in charge of sales and distribution. He has spent the past 12 years in the field of sales and merchandising.

GEORGE W. BROWN, with the company since 1926, has been appointed executive engineer for *WAGNER ELECTRIC CORP.*, St. Louis. Most recently, he has been industrial relations director.

PENN CONTROLS, INC., Goshen, Ind., has appointed *E. A. PRICE*, formerly manager, New York district office, as educational director for the company. He will handle all phases of sales education and the training of new sales personnel.

EDMUND T. FLANAGAN has been elected vice president in charge of sales for *THE FAIRBANKS CO.*, New YORK. Most recently he has been New York office and regional sales manager.

ARTHUR V. DeYOT has been named plant manager at the Middletown, Pa., steel boiler fabricating plant of *THE NATIONAL RADIATOR CO.*, Johnstown, Pa. He joined the company in 1951 as a plant engineer in New Castle, Pa.

THOMAS D. CARTLEDGE has been appointed president of *LINDE AIR PRODUCTS CO.*, a division of *UNION CARBIDE AND CARBON CORP.*, New York. He has been senior vice president of the division, and a director and vice president of Dominion Oxygen Co., Ltd., a corporation subsidiary.

At the 35th annual meeting of the *NATIONAL ASSOCIATION OF FAN MANUFACTURERS, INC.*, the following officers were elected for the ensuing year: *R. A. WASSON*, Clarage Fan Co., president; *J. M. FRANK*, Ilg. Electric Ventilating Co., vice president; and *L. O. MONROE*, secretary-treasurer.

There have been a number of personnel shifts and staff additions in the Dust & Fume Control Div., *AMERICAN WHEELABRATOR & EQUIPMENT CORP.*, Mishawaka, Ind. *W. S. SCHAMEL*, formerly sales engineer, is now assistant technical director. *G. W. ROPER*, *J. K. DAVIDSON*, and *F. A. LINDAHL* have been named

KENNARD *Engineered*

Heating and Ventilating Units

Air Volumes from 400 to 21,000 CFM

Kennard Heating and Ventilating Units are the answer to requirements of heating and filtering recirculated air, fresh air, a mixture of both, or for ventilation only. These ruggedly constructed and easily installed units, conventionally used for heating large spaces or as a central station unit to heat many small rooms, can also be utilized for a variety of special and process applications.

Wall - Floor - Ceiling Mountings

Pre-heat and Re-heat Coils - 1.1 to 32.5 sq. ft. face.

Moderate tip speeds and outlet velocities

Optional Equipment

Mixing Box and Dampers • Face and By-pass Dampers • Throwaway, Cleanable or High Velocity Filters • Target, Grid or Pan Humidifiers.

Representatives in Principal Cities

Write for name of nearest representative and complete information on Air Conditioning Blower Units—Finned Coils—Evaporative Condensers—Cooling Towers—Sprayed Coil Dehumidifiers—Multi-Zone Air Conditioning Blower Units.

KENNARD CORPORATION • 1817 S. HANLEY ROAD ST. LOUIS 17, MO., U.S.A.

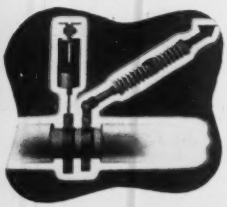
Got
PIPING PALSY?

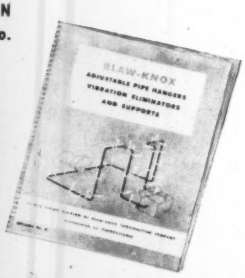
If your power piping is cracking walls, loosening joints, playing hob with valves and ruining your disposition, it's high time you straightened things out with

BLAW-KNOX PIPE HANGERS

These *standard* Hangers, Supports and Vibration Eliminators can be ordered and installed directly from technical information available in Catalog No. 51, with assurance that they will correct the faults which cause "piping palsy." Any problems concerning thermal movement, weight of piping materials and hanger location have been solved in advance. Write for Catalog No. 51 today—no obligation.

POWER PIPING DIVISION
Blaw-Knox Construction Co.
Pittsburgh 33, Pa.





BLAW-KNOX PIONEERS IN THE DEVELOPMENT OF
FUNCTIONAL HANGERS
VIBRATION ELIMINATORS

project engineers. Three additional graduate engineers have been added as project engineers: *W. G. CARRIE*, for 25 years with Consolidated Mining and Smelting Co., Trail, B.C.; *W. H. WILLIAMSON*, formerly with Procter & Gamble, Cincinnati; and *F. R. CULHANE*, formerly with Phelps-Dodge Corp., Morenci, Ariz.

F. SHIRLEY WILCOX has been appointed director for the *FEDERAL HOUSING ADMINISTRATION* in the state of Indiana. For many years he has been engaged in private business in Indiana, and was state treasurer from 1949 to 1951.

THE TRANE CO., La Crosse, Wis., has promoted two sales department members. *C. R. CONNER* is now general sales department assistant in charge of jobber sales, and *R. S. KNOWLES* will handle gas unit heater sales in addition to his regular duty as manager of hot water specialties sales.

FRED J. EBELING has been appointed to the newly created post of general sales manager for *DODGE MFG. CORP.*, Mishawaka, Ind. He has been assistant secretary and treasurer.

F. C. BOYCE has been re-elected president of the *D. J. MURRAY MFG. CO.*, Wausau, Wis., for the 20th consecutive time. Other officers re-elected are *M. P. McCULLOUGH* and *D. C. EVEREST*, vice presidents; *A. W. PLIER*, executive vice president and general manager; *G. L. RUDER*, treasurer; *W. A. MARQUARDT*, secretary; and *C. L. DURKEE*, vice president and sales manager.

JOSEPH T. MALONEY, sales executive for *ACME INDUSTRIES, INC.*, Jackson, Mich., has resumed his position with the company after completing a six month tour of duty with the National Production Authority, where he was the industry analyst with the air conditioning and refrigeration section of the general industrial equipment division.

TRUMAN B. BROWN has been appointed assistant to the vice president for sales, *ALLEGHENY LUDLUM STEEL CORP.*, Pittsburgh. He has been district sales manager for Detroit.

DR. PAUL D. MERICA, executive vice president and a director, has been elected president of *THE INTERNATIONAL NICKEL CO. OF CANADA, LTD.*, and *DR. JOHN F. THOMPSON*, retiring president, continues as chairman of the board, a post he has held since 1951. For the U.S. subsidiary, *THE INTERNATIONAL NICKEL CO., INC.*, the same changes are in effect. Also for the subsidiary, *WALTER C. KERRIGAN*, vice president, has been elected to the newly-created post of vice president and general sales manager, responsible for both nickel and mill products sales, with *L. R. LARSON* elected assistant vice president and assistant general sales manager. *THEODORE H. DAUCHY*, *RICHARD A. CABELL* and *JOHN A. MARSH* also have been promoted to assistant vice presidencies. In addition, *RANSOM COOPER, JR.*, has been appointed manager of the nickel sales department and *H. D. TIETZ*, manager of the nickel alloys department.

It's the LOW DOWN DIRT trapped by WILSON'S HAIR FILTERS that GUARANTEES LONGER LIFE

In Wilson *Hair* Filters the entire dust-holding capacity is completely utilized. This means, *no surface dust stopping only*, but Full-Depth Dust Trapping at its best . . . and many extra months of filter life.

The *reasons* are so simple:

1. The hair media in Wilson *Hair* Filters act in the same manner as Mother Nature's proven way of filtering the air you breathe. It's the *hair* that cleans the air . . . more easily, more effectively, more economically.
2. The multi-directional distribution of the hair in Wilson *Hair* Filters literally invites all dust and dirt to come in and be trapped throughout the entire filter interior.
3. Most brands of air filters require oiling on their inlet surfaces. This stops dust prematurely, loads up the incoming air side and materially shortens filter life.

Wilson Hair Filters are not oiled on the inlet side. Instead, they receive an even distribution of mineral oil *on their outlet surface*, which:

(a) augments the already amazing ability of the hair itself, to catch and hold dust, and—

(b) builds an impregnable barrier which halts dust and dirt after reaching the furthermost practicable penetration point.

WILSON & CO., INC.
(Air Filter Division) 4100 South Ashland Ave., Chicago 9, Ill.

Wilson Hair Filters are another quality product of Wilson & Co., world-famous for meat products, sports equipment, pharmaceuticals, hair products, etc.

The famous Edgeseal, the original *Hair* Filter with the patented self-sealing edge.

The popular Honeycomb, the dressed up *Hair* Filter that is so easy to handle.

Save delay. Save dollars. Save doubt. Send for FREE sample with details and prices.

INDOOR COMFORT — WILSON'S HAIR FILTER — WILSON & CO.

NOW is the time to consider

SNOW MELTING

Systems around Buildings and Grounds

Better send at once for our SNOW MELTING MANUAL. Here are design data based on a study of—and others' actual experience with over 100 snow melting systems of all kinds for

- **LOADING PLATFORMS and DOCKS**
- **SIDEWALKS • ROADS • DRIVEWAYS**
- **MARQUEES • PARKING AREAS**
- **RUNWAYS • RAILWAY SWITCHES**

and other applications which HAVE proved that this modern method of snow removal

Costs No More Than Other Methods

—and because snow melting by pipe coils has other distinct advantages, such as dirt-free sidewalks and entrances, and the complete elimination of ice surfaces, the demand for this method of snow removal is swiftly growing.

Complete information on the correct design, installation and operation of snow melting systems is offered in the new SNOW MELTING MANUAL, a reprint of articles originally published in HEATING, PIPING & AIR CONDITIONING.

$1.00 will bring you this SNOW MELTING MANUAL . . . a valuable addition to your file on business opportunities.

Heating, Piping & Air Conditioning

6 North Michigan Avenue **Chicago 2, Illinois**

Stop

costly shut-downs and heavy repair bills caused by dirt, rust or scale carried in pipe lines to regulators, traps, pumps, meters, burners, etc.

USE Sarco strainers also to remove impurities from any fluid end product.

Sizes ¼" to 8", for any commercial pressure.

Write for new Bulletin 1202 514

SARCO SAVES STEAM — SARCO COMPANY, INC. Empire State Bldg., New York 1, N.Y. SARCO CANADA, LTD., TORONTO 5, ONTARIO

CHESTER
plasticord-plasticote
WIRES and CABLES
OIL BURNER IGNITION WIRE
THERMOSTAT CABLE
TW WIRE
INSTRUMENT WIRE
Tested and approved
-for safety and dependability beyond specification
CHESTER makes them all!
JAN-C-76 APPROVED WIRES
80-90-105°C HOOK-UP WIRE
SHIELDED WIRE AND CABLE
FLEXIBLE CORDS
COAXIAL CABLE
TELEVISION LEAD IN CABLE
GAS TUBE HIGH TENSION CABLE
OIL BURNER IGNITION CABLE
BLASTING WIRE
TELEPHONE WIRE
THERMOSTAT CABLE
BELL AND OFFICE WIRE
TW BUILDING AND FIXTURE WIRE
All Chester wire and cable features the extra dependability, long service life and easier working qualities of plastic insulation. Their tough, impervious plastic coats provide maximum immunity to abrasion, weather, oil and most chemicals. They are smooth, pull through conduit with minimum effort and present a fine appearance in exposed locations.
There's a Chester single or multi-conductor wire or cable for practically every indoor or outdoor requirement including many special constructions for the electrical, electronic, TV, radio, telephone and other industries. Why not write today for full information?
CHESTER CABLE CORP.
CHESTER, NEW YORK
MANUFACTURERS OF QUALITY WIRE AND CABLE
FOR EVERY ELECTRICAL AND ELECTRONIC REQUIREMENT

E. M. KLINE is now general manager of the Huntington, W. Va., works, succeeding *HERMAN M. BROWN*, who is retiring under the company's retirement plan. *G. K. CROSBY* is now assistant general manager.

GEORGE R. BEESE, with *C. A. DUNHAM CO.*, Chicago, from 1925 to 1941, recently rejoined the company as assistant to the president, supervising engineering and manufacturing activity.

JOHN A. HILL, president, Air Reduction Co., Inc., has been elected president of the *COMMERCE AND INDUSTRY ASSOCIATION OF NEW YORK, INC.* Previously vice president, he succeeds *GEORGE V. HOLTON*, Socony-Vacuum Oil Co., Inc., who headed the organization for two years. *WILLIAM L. KLEITZ*, Guaranty Trust Co., of New York, was re-elected a vice-president. Two new vice presidents are *GERALD LeVINO*, Guiterman Co., Inc., and *EDMUND F. WAGNER*, General Realty & Utilities Corp. *SAMUEL D. LEIDESDORF*, S. D. Leidesdorf & Co., was re-elected treasurer. Also re-designated were *JOSEPH A. SINCLAIR*, secretary, and *THOMAS J. MILEY*, executive vice president.

FOSTER N. MABEE, president, Colorado Natural Gas & Fuel Co., was elected president of the *LIQUEFIED PETROLEUM GAS ASSOCIATION*, Chicago, at the final session of its recent annual convention.

CHARLES SANDERS is now sales manager of the transportation division for *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, Minneapolis. He has been western sales manager for the division, and succeeds *MAURICE R. EASTIN*, who has resigned.

G. T. KAUFMAN has been named manager, engineering service, of the new Petro Heating and Power Equipment Div., *IRON FIREMAN MFG. CO.*, Cleveland. For the last seven years he has been technical secretary of the Oil Heat Institute of America.

WORTHINGTON CORP., Harrison, N.J., has appointed three men to newly-created managerial positions. *ROY CARTER* is manager, Volute Pump Section. *L. H. GARNER* is manager, Process Pump Section. *I. J. KARASSIK* is manager, Multi-Stage Pump Section. All three men were formerly assistant to the manager of the Centrifugal Pump Div. New regional manager for the Middle East is *J. R. HUTCHISON*, who will manage activities in Cyprus, Egypt, Greece, Iran, Iraq, Israel, Lebanon, Syria, Trans-Jordan and Turkey.

ROBERT J. LUCAS has been elected vice president of *CLEVELAND STEEL PRODUCTS CORP.*, Cleveland. He will be in charge of the company's Toridheet Div.

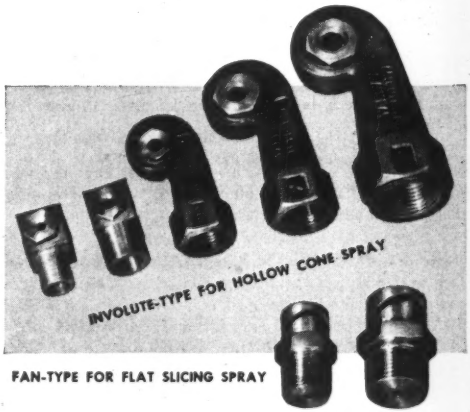
B. J. LATTNER, formerly vice president and heating sales manager, has been elected executive vice president and general manager of *CENTURY ENGINEERING CORP.*, Cedar Rapids, Ia. *W. S. MOELLERING* succeeds him as heating sales manager.

FREDERICK C. STAKEL is now advertising manager for *ALUMINUM CO. OF AMERICA*, Pittsburgh. For-

for • SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

YARWAY

SPRAY NOZZLES



Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

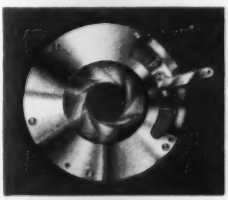
Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

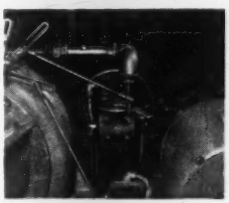
Thousands in use. Write for new Bulletin N-616.

YARNALL-WARING COMPANY
107 Mermaid Avenue Philadelphia 18, Pa.

STEAM-PAK GENERATORS AUTOMATICALLY REGULATE OPERATION TO LOAD DEMAND

Steam-Paks, the modern steam generators, built by York-Shipley, regulate themselves automatically by load demand, furnishing steam or hot water when required. The Iris Shutter air control (upper right) and Metering Oil Pump (lower right) supply the correct amount of air and oil as required by load demand. This means highest combustion efficiency, lower operating costs. Steam-Paks cover the full range from 15 to 300 hp. for low or high pressure steam or hot water and are fired by oil, gas, or a combination of oil and gas.



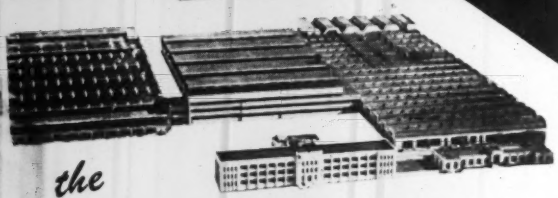


GET YOUR COPY OF THIS MANUAL TODAY!

"Steam in a Package"—a 14 page book which tells the installation and operating advantages of York-Shipley Steam-Pak Generators. Write today for your free copy of Bulletin 201-D.

YORK-SHIPLEY, INC.
Industrial Division, York 8, Pa.
Automatic Heat and Power Specialists since 1918

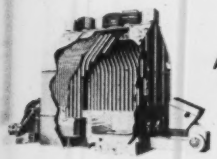
Specify LEE



the
GLENN L. MARTIN COMPANY does
(BALTIMORE, MARYLAND)

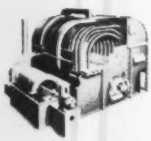
Throughout the entire Glenn L. Martin plant in Baltimore, there are Lee Heaters which were completely engineered for a partiular need.

Lee Heaters heat, ventilate and supply make-up air to over 5,000,000 sq. ft. of space throughout the plant, and have the capacity of the amazing figure of 300,000,000 BTU with a total blower capacity of 3,000,000 CFM.



Model VTH

THERE'S NO HEATING OR AIR-REPLACEMENT PROJECT TOO LARGE FOR LEE HEATERS.



Model TSE

Model HD

LEE HEATERS FOR:
- space heating
- make-up air
- coal and ore thawing
- process heating
- crop drying
- de-humidifying, de-fogging, de-icing
- comfort heating — schools, churches, etc.

LEAN TO LEE . . . Specify Lee they're economical . . . you get more heat for less cost.

Complete engineering data for all Lee Heaters on request.
Representatives in all principal cities.

SPECIFY LEE
the completely engineered heater

LEE CORPORATION
(HEATERS SINCE 1918)
1001 TATNALL STREET, WILMINGTON, DELAWARE
BALTIMORE, MD. CHICAGO, ILL.

merly he was manager of advertising and sales promotion for Brown Co., Berlin, N.H.

The new assistant sales manager, Heating Div., *RICHMOND RADIATOR CO.*, New York, is *GEORGE DAY*, with the company since 1948.

INDEPENDENT PNEUMATIC TOOL CO., Aurora, Ill., has inaugurated an industrial sales division for "Thor" power tools, and made three promotions to expand the division's sales department. *J. A. HILL* is manager of industrial sales; *J. F. CORKERY* is manager of electric tool sales, succeeding Mr. Hill; and *G. A. THOMA* is sales promotion manager, succeeding Mr. Corkery.

ERNEST J. KLIMCZAK has been appointed chief engineer, secretary, and member of the board of directors of *AHLBERG BEARING CO.*, Chicago. He joined the company nine years ago as a tool engineer.

At the 30th annual meeting of the *COPPER & BRASS RESEARCH ASSOCIATION*, the following officers were re-elected: president, *W. M. GOSS*, Scovill Mfg. Co.; vice presidents, *M. W. ACKER*, Olin Industries, Inc., *R. C. DIEHL*, Chase Brass & Copper Co., *J. A. DOUCETT*, Revere Copper and Brass, Inc., and *A. R. ZENDER*, Bridgeport Brass Co.; treasurer, *F. L. RIGGIN*, Mueller Brass Co.; manager, *T. E. VELTFORT*; and secretary, *B. B. CADDLE*. The following men were elected vice presidents: *W. W. SIEG*, Titan Metal Mfg. Co., *F. R. SLAGLE*, The Miller Co.; and *A. C. WHEELER*, The Seymour Mfg. Co.

MILTON LEVINE has been appointed assistant chief engineer, Air Conditioning Div., *MITCHELL MFG. CO.*, Chicago. Formerly he was with the All-States Engineering Co.

HARRY POTTER is now a factory sales engineer with *FIELD CONTROL DIV.*, Mendota, Ill. Most recently, he has been in hard goods retailing.

AUGUST TOENNIESSEN, of *DAVIS REFRIGERATION CO., INC.*, is the first mechanic selected for membership in the *NATIONAL GUILD OF SUPERIOR MECHANICS*, an honorary association sponsored by *BONNEY FORGE & TOOL WORKS*, Allentown, Pa. Nominations for membership are made by jobber salesmen who are familiar with the work and character of the mechanic or service manager nominated.

THOMAS W. SIMMONS, JR., has been elected president and general manager of *JOHNSTON PUMP CO.*, Pasadena. He was formerly vice president and general manager.

JOY MFG. CO., Pittsburgh, has elected *WILLIAM L. WEARLY* to the post of general sales vice president in charge of all domestic sales including Canada and Mexico. He has been vice president, coal machinery sales.

HOWARD A. BLAIR has been appointed product manager of self-contained products, Air Conditioning Div., *WESTINGHOUSE ELECTRIC CORP.*, Pittsburgh.

To cut fuel costs -specify and install a...

Cleaver-Brooks HEV-E-OIL® BURNER

Using Low Cost No. 5 Oil

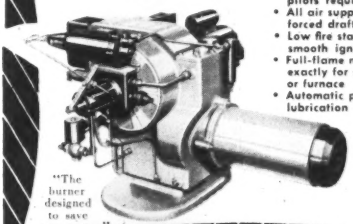
Fuel costs can be cut two ways—in the total amount used per year and in lower cost per gallon, with a Cleaver-Brooks HEV-E-OIL burner. Designed to save money, a burner that efficiently uses the heavier grade oils up to and including free-flowing, high-heat, low-cost No. 5 oil, as well as today's light oils. Users report savings as much as 20% to 30%.

Available in five sizes — 1 to 60 gals. per hour capacity. Write today for complete information and descriptive bulletin—AD102.

CLEAVER-BROOKS COMPANY, HEV-E-OIL Burner Division
Dept. H-380 E. Keefe Avenue, Milwaukee 12, Wis.

These HEV-E-OIL Features Cut Your Fuel Costs:

- Burns low-cost, high-heat No. 5 oil
- Automatic all-electric ignition — no expensive gas-pilots required.
- All air supplied by large forced draft fan
- Low fire starting — safe, smooth ignition
- Full-flame modulation — set exactly for size of boiler or furnace
- Automatic pressure lubrication
- High efficiency through accurately measured oil and air flow



"The burner designed to save you money"

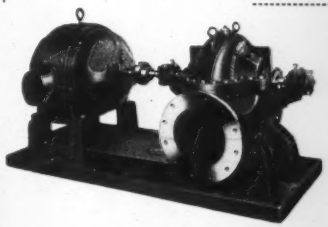
"Buffalo" Tips on Better Pumping

REDUCE FIRST COST BY CHOOSING TOP RECOMMENDED PUMP SPEED

Generally, the higher the operating speed, the smaller the pump you need for a given capacity. This saves on first cost and critical materials so badly needed today. On the other hand, ordering a pump on the basis of having a large margin of capacity can result in purchasing a wastefully large pump. This is why it is so important to give your pump supplier all possible facts about your pumping job — specific gravity, temperature and chemical analysis of liquid to be pumped, discharge head in feet, gallons per minute.

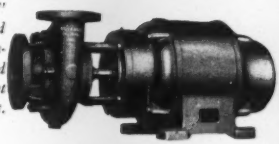
A Caution

OVERSPEEDING a pump naturally shortens its life, and is even more wasteful than using an oversize pump. Thus, the driver speed should be in line with the supplier's recommendation. "Buffalo" engineers are ready to advise you as to the right pump for your expected conditions — a quality-built "Buffalo" Pump of the exact size and construction consistent with best service and economy on the job. Write us *today* about your pumping problem!

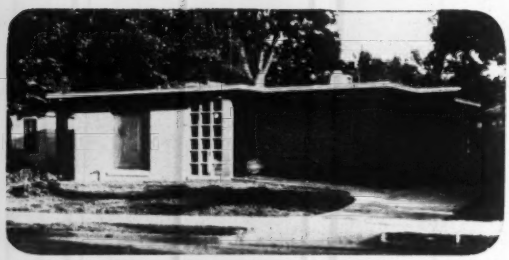


Left, "Buffalo" Class "SL" Double Suction for efficient clear water service. 10 to 14,000 gpm capacities. Write for Bulletin 955-p.

Right, "Buffalo" Close-Coupled Pumps are compact, durable and assure permanent shaft alignment. Bulletin 975-B.



BUFFALO PUMPS, INC.
171 MORTIMER STREET BUFFALO, NEW YORK
Canada Pumps Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities
A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID



Dr. Howell's Clinic at Canton, Miss. Is cooled with a Frick Unit Air Conditioner. Installation by The Munford Engr. Co., Jackson.

Superior Establishments Call for Superior Air Conditioners

You get this extra quality when you buy Frick Units. They're better designed, more carefully built, and are installed by experienced refrigerating engineers. They are honestly rated: by actual comparison, Frick Units deliver more cooling effect per dollar invested.

Frick Unit Conditioners Include Winter Heating Coils when Desired.

Two sizes, 5 and 7½ horsepower. Get the full facts on Frick Unit Air Conditioners — the choice of those who want the ultimate in quality—before you buy. Write

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

Below: This Duncan Hines Approved Restaurant at Arlington, Va., Uses Two Frick Unit Conditioners.

He has been in charge of air conditioning service activities of the company for the past nine years. *JAMES R. WEAVER* has been named assistant to the vice president in charge of manufacturing. For the past four years he has been on assignment to Baldwin-Lima-Hamilton Corp., where he served as vice president in charge of manufacturing.

Judge *WM. A. KELLY*, head of the Stamford, Conn., law firm of Cummings and Lockwood, has been elected treasurer of *PEABODY ENGINEERING CORP.*, New York. He succeeds *C. A. SNIDER*, who is retiring as treasurer, but is remaining a director.

HENRY W. ARMSTRONG is now vice president in charge of finance, *JOSEPH DIXON CRUCIBLE CO.*, Jersey City. He has served as director of the parent company and its subsidiaries for a number of years. *JOSEPH P. TEMPLETON*, formerly secretary and comptroller, is now secretary-treasurer. *WALTER H. BUCKHOUT*, formerly chief accountant, is now comptroller.

THE YOUNGSTOWN SHEET AND TUBE CO., Youngstown, Ohio, has elected *FRED TOD, JR.*, as a director, and *J. L. MAUTHE* (president), to the company's executive committee. They succeed *JOHN TOD*, who resigned from both posts after 29 years' service.

The *INSTITUTE OF GAS TECHNOLOGY* (affiliated with Illinois Institute of Technology, Chicago) has confirmed the appointments of director *E. S. PETTYJOHN* as vice president, *DR. J. D. PARENT* as dean, and *HENRY R. LINDEN* and *C. G. VON FREDERSDORFF* as assistant research directors.

NILES W. LEUCK, formerly with Bersted Mfg. Co., has been appointed executive vice president, *ELECTRIC STEAM RADIATOR CORP.*, Paris, Ky.

. . . IN THE TERRITORIES

For *PENN CONTROLS, INC.*, Goshen, Inc.—new sales engineer, New York district office, is *ROBERT D. EICHMAN*. *GEORGE SANDER*, formerly sales engineer in that district, is now district manager.

For *JOHNSON SERVICE CO.*, Milwaukee — manager, Cincinnati branch, is *TREVOR D. REILEY*, who formerly headed the Nashville branch. He will also direct operations of offices in Kentucky, southern Ohio and part of West Virginia. *NORMAN A. BALLINGER*, formerly with the Cincinnati branch, is the new manager of the Louisville office. The Georgia, Florida, Alabama and Tennessee offices have been placed under the direction of *WILLIAM P. WEST*, Atlanta branch manager. *JAMES R. POTTER* has joined the sales staff of the Nashville office, and *KENNETH S. ALEXANDER* has been assigned to the Knoxville office.

For *FARR CO.*, Los Angeles — four new representatives: *DONALD SOUTHARD*, Denver, to cover the Colorado and Wyoming territory; *F. W. JENIKE CO.*, Cincinnati, for the Cincinnati trading area and the state

RADIANT HEATING PIPE BENT QUICKLY, ACCURATELY WITH GREENLEE PIPE BENDER

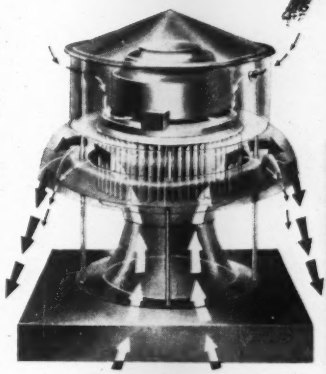
Install radiant heating pipe the timesaving, accurate way . . . with the GREENLEE 770-R Hydraulic Pipe Bender. With it one man *in a few minutes* can make 90° and return bends in *cold* pipe of sizes ½", ¾", 1",1¼", 1½" and 2". Operation is simple, quick. The GREENLEE is compact, portable . . . easy to carry, set up and operate exactly where and when needed. And it is specially designed to produce *accurate duplicate bends* so that the entire series of bends has smooth uniformity throughout. Do the job easier, faster, *better* with a GREENLEE Bender. Write for free Bender booklet.

TOOLS FOR CRAFTSMEN

GREENLEE

Greenlee timesaving tools for plumbing and heating work . . . Hydraulic Pipe Benders Tubing Benders • Hydraulic Pipe Pushers • Pipe Bits • Auger Bits • Spiral Screwdrivers • Chisels and many more. Write for details. Greenlee Tool Co., 2347 Twelfth Street, Rockford, Illinois.

How to Tell Quality in Power Ventilators



Pat. 2188741 2526290

1. Rugged Construction
2. Certified Ratings
3. Scroll Effect
4. Safe Moisture and Fume Removal

Before you buy any power ventilating equipment — compare the Gallaher Air-Van.®

Pound for pound Air-Vans have the heaviest construction of any comparable unit. Air-Vans are shipped with or without bases completely assembled, ready to install.

Gallaher performance rating are the result of independent laboratory tests. They are not interpolations which research has shown can be grossly inaccurate.

Air-Vans are designed with *scroll effect* built-in. Tests show that efficiency against even normal static pressures is impossible without this feature.

Motor out of air stream and a patented *positive air seal* off prevents fume passage into motor housing. Air-Vans have been specified WITHOUT special motors for ether and air concentrations.

Capacities 150-11,000 CFM Static Pressures to 1¾"

Need Ventilation in a Hurry?

Gallaher Power Ventilators are available for immediate shipment in almost every size.

THE GALLAHER CO.
4108 Dodge St.
Omaha, Nebraska

Please send me full catalog information about Gallaher Power Ventilators.

NAME _____

ADDRESS _____

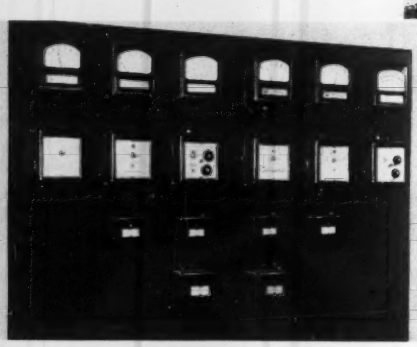
CITY _____ STATE _____

The GALLAHER Company

Omaha Nebr. Owatonna Minn.

Expansion program at Marquette University again includes PERFEX Industrial Instruments

This new Marquette Business Administration building at Milwaukee, Wis. is heated from the lower campus central heating plant which is equipped with Perfex Industrial Instruments. The new building program at Marquette includes a new Memorial Library, Student Union, Residence Hall and additional buildings for the Medical and Dental Colleges . . . and again Perfex Industrial Instruments are specified.

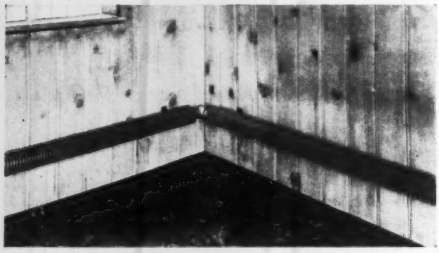


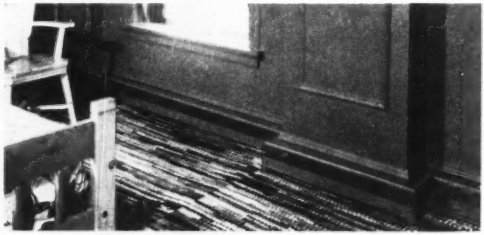
SEND FOR LATEST BULLETIN ON MONEY-SAVING CONTROLS FOR GAS, OIL, STOKER-FIRING

PERFEX

INDUSTRIAL INSTRUMENTS

Perfex Corporation, Milwaukee, Wis. • In Canada, Perfex Controls Ltd. Guelph, Toronto

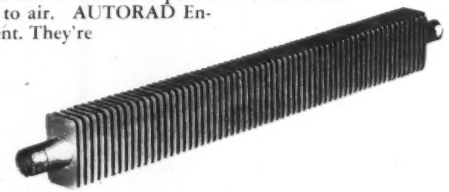




For INDUSTRIAL HEATING . . For DOMESTIC HEATING

Whether your heating job is industrial or residential, AUTORAD Baseboard Radiation is ideal because it spots the heat where it's most effective in heating the room and because it does away with unsightly, in-the-way radiators. AUTORAD Finned Pipe delivers maximum heat; the fins assure efficient heat transfer from pipe to air. AUTORAD Enclosures are well designed, attractive and highly efficient. They're easy to install, easy to keep clean and interfere in no way with furniture arrangement in home or office.

On your next job, use AUTORAD Baseboard Radiation and get your maximum profit.



AUTO-RAD INC.

3535 FILLMORE STREET
CHICAGO 24, ILLINOIS

of Kentucky; *THE CHARLIE WOOD CO.*, Columbus, Ohio, for Columbus, Dayton, Mansfield, and Coshockton trading areas; and *THE WILLIAM M. SHANK CO.*, Indianapolis, for southern Indiana.

For *CRANE CO.*, Chicago — six new branch managers: *K. D. ACKAD*, Washington; *CLYDE O. PRICKETT*, Philadelphia; *MANUEL F. Du CHATEAU*, New Orleans; *ALONZO H. SPRINKLE*, Greensboro, N.C.; *ARTHUR S. HEATH*, Rocky Mount, and *FRANK E. HART*, Great Falls, Mont. Two new assistant managers named are *FRANCIS C. McKEE*, Sioux Falls, and *LEO A. DONINI*, Richmond.

For *CARRIER CORP.*, Syracuse — a new branch office in Syracuse, to serve Syracuse and environs east to Albany, north to the Canadian border, and south to the Pennsylvania state line. *CLARENCE A. NOLPH*, formerly with the Rochester, N.Y., branch, has been named manager at Syracuse. *J. A. GAZELLE* has been appointed western sales manager, Dealer Div., with headquarters in Los Angeles. He will have responsibility for sales in states along the Pacific, and in the Rocky Mountain states of the Denver branch and the entire state of Texas.

For *BUSH MFG. CO.*, West Hartford, Conn., and *HEAT-X-CHANGER CO.*, Brewster, N. Y.—*HOWARD J. THEIS*, now sales engineer for North Dakota, South Dakota, Nebraska, Iowa, Minnesota, and the northwestern part of Wisconsin, with headquarters in Minneapolis.

For *WORTHINGTON CORP.*, Harrison, N. J.—*J. P. McARTHUR* is now manager, Philadelphia district sales office, succeeding the late *W. J. DALY*. *H. W. KING*, formerly manager, San Francisco district office, succeeds Mr. McArthur as regional manager, west coast sales. *P. L. McMANUS* succeeds him in San Francisco.

For *OWENS-ILLINOIS GLASS CO.*, Toledo — *GRAM ASBESTOS CO.*, Erie, Pa., and *ALLIED SERVICES, INC.*, Charleston, W. Va., have been appointed distributor-applicators for "Kaylo" heat insulation. *C. MERLE CALL*, former New York sales engineer for the Kaylo Div., has been reassigned to that territory after 18 months of duty with the Marines. He will be in charge of the sale of building and heat insulating products in the Albany area.

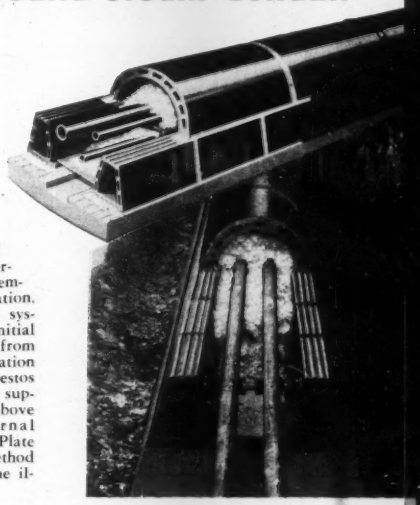
For *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, Minneapolis — *EARLE BARKER* is eastern sales manager of the transportation division. He has been associated with the division for five years, with headquarters in New York.

For *THE NATIONAL RADIATOR CO.*, Johnstown, Pa. — three new sales representatives: *ENGINEERING SALES CO.*, New Orleans, for Louisiana, Mississippi, and the Mobile area of Alabama; *S. C. BRATTON SALES ENGINEERS, LTD.*, Nashville, for Tennessee, east of the Tennessee River; and *ROY I. GUILD, JR.*, formerly with the Richmond, Va., office, in North Carolina. Mr. Guild will have headquarters at 1207-D Whilden Pl., Greensboro, N.C., but will continue to report to the Richmond branch.

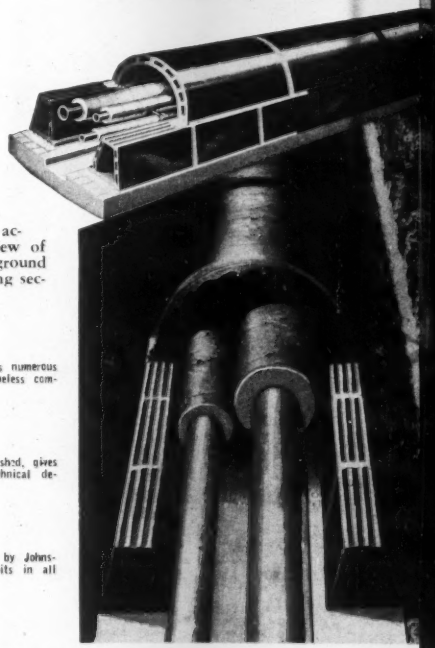
Therm-O-Tile

REG. U.S. PAT. OFF.

Underground Steam Conduit



At the right we show an assembly view and an actual installation view of Therm-O-Tile Underground Pipe Conduit employing filler type insulation. The flexibility of this system makes for low initial cost without detracting from the high over-all insulation efficiency. Note the Asbestos Separator Plate which supports the insulation above the Emergency Internal Drain. This Separator Plate is not needed in the method of insulation used in the illustration below.



Here we show an assembly view and an actual installation view of Therm-O-Tile Underground Pipe Conduit employing sectional pipe covering.

Competitive in Cost

Although Therm-O-Tile offers numerous superior features it is nevertheless competitive in total first cost.

Ask for Bulletin 511

This bulletin, recently published, gives complete construction and technical details.

Johns-Manville

Therm-O-Tile is represented by Johns-Manville Technical Service Units in all principal cities.

H. W. PORTER & CO., INC.

822-H Frelinghuysen Avenue • Newark 5, N. J.

REID HAYDEN, INC.

BALTIMORE, MD. RICHMOND, VA. CHARLOTTE, N. C.

Insulation Engineers & Contractors

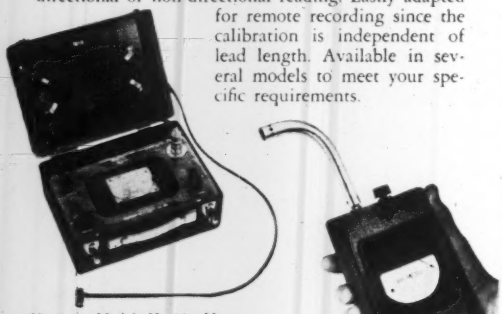
MEASURE AIR VELOCITY DIRECTLY AND ACCURATELY

WITH A

HASTINGS AIR-METER

The most sensitive of all air meters for research, industrial and agricultural applications. Reads directly in feet-per-minute on a logarithmic-type scale expanded at lower velocities. Highly sensitive — will indicate the velocity of smoke rising from a cigarette. Response time less than one second. Accurate to within ± 2% regardless of ambient temperature or static pressure.

Uses the exclusive Hastings noble metal thermopile in an extremely stable circuit. Instantaneous range switching without recalibration. Probes available for directional or non-directional reading. Easily adapted for remote recording since the calibration is independent of lead length. Available in several models to meet your specific requirements.



Hastings Model H Air Meter. Compact unit for field and laboratory use. Velocity Ranges: 10-750 fpm; 750-5500 fpm.

Hastings Model G Air-Meter. Small hand type instrument. Velocity range: 0-6000 fpm; Weight: 26 ounces.

Hastings Model B Air Meter for measurements of greatest precision. Velocity ranges: 0-400 fpm; 400 to 6,000 fpm. Meter type continuous calibration check. Knife edge, parallax free indicator.

Write for descriptive literature and prices on Hastings Air Meter, Manometer and Flowmeters, and Vacuum Gauges.

HASTINGS INSTRUMENT COMPANY, INC.

HAMPTON, 33 VIRGINIA

DESIGNERS AND BUILDERS OF RAYDIST AND SPECIAL ELECTRONIC, ELECTRICAL, AND MECHANICAL INSTRUMENTS

For *CLEAVER-BROOKS CO.*, Milwaukee — *MASON EQUIPMENT CO.*, 2281 Wildwood Blvd., Toledo, Ohio, representative for nine counties in northwestern Ohio.

For *ALLEGHENY LUDLUM STEEL CORP.*, Pittsburgh — *IAN R. KILTIE*, member of the Detroit sales staff, appointed district manager of sales. *H. H. LARDIN* has been named assistant manager.

For Williams Oil-O-Matic Div., *EUREKA WILLIAMS CORP.*, Bloomington, Ill. — *W. C. BARRETT* is field sales manager, eastern area, with headquarters in the Chrysler Bldg., New York. He succeeds *H. H. FALKINGHAM*, resigned. *R. L. HOLMBERG* is representative for Chicago and vicinity, and *M. H. NORTON* is supervisor of dealer relations.

For *WOLVERINE TUBE DIV.*, Calumet & Hecla Consolidated Copper Co., Detroit — *A. S. KINGERLEY* is now assistant to the midwestern district sales manager, with headquarters in Detroit. His jurisdiction will include Michigan, northern Ohio and a portion of Indiana. *JOHN P. HOWLAND* is representative, Dallas area, headquarters, Rm. 206, 309 Browder St., Dallas 1.

For *TIME 'TROL CO.*, New York — *BRUNO-NEW YORK INC.*, RCA distributor, is exclusive distributor for the company's air conditioner timer switch in the New York metropolitan area. Other exclusive distributorships have been given to *BETCO INC.*, Louisville; and *MAIN-LINE DISTRIBUTORS*, Toledo and Cleveland, RCA distributors in their respective territories.

For *JOSEPH SIMONS CO.*, Hartford, Conn. — *VERNON E. LITTLEFIELD* has rejoined the sales force, and will concentrate on the Vermont and New Hampshire districts.

For *CONOFLOW CORP.*, Philadelphia — *INSTRUMENT SALES CORP.*, 2137 Second Ave., Seattle, is representative in the Pacific Northwest, servicing Washington, Oregon, and northwest Idaho.

For *WARD LEONARD ELECTRIC CO.*, Mount Vernon, N.Y. — the Los Angeles branch office and warehouse have been moved to new and larger quarters at 1605 E. Olympic Blvd.

For Janitrol Domestic-Commercial Div., *SURFACE COMBUSTION CORP.*, Toledo — *JOHN G. ROBINSON* is now sales engineer, Buffalo territory.

For *STURTEVANT DIV., WESTINGHOUSE ELECTRIC CORP.*, Boston — eight new regional managers to supervise application of air handling apparatus in their areas: *J. H. SPENCER*, northeastern region, headquarters in Boston; *H. F. BRUSH*, middle Atlantic region, headquarters in Philadelphia; *ROBERT MERCER*, north-central region, headquarters in Cleveland; *D. W. DAVIS, JR.*, northwestern region, headquarters in Chicago; *W. J. OONK*, southwestern region, offices in St. Louis; *D. M. HUTCHINSON*, southeastern region, offices in Atlanta; *H. W. RAINEY, JR.*, new south-central region, head-

ALDRICH

Solves Your Hot Water Problems with

On-the-Spot Supply

ALDRICH

High Delivery

HOT WATER HEATERS

7 MODELS

93 to 850 GPH

Oil Fired — Gas Fired

On-the-Spot Supply for

Factories	**Schools**
Stores	**Institutions**
Restaurants	**Hospitals**
Terminals	**Additions**

SAVE
Costly Piping
Installation Time
Temperature Loss

Need hot water in remote locations? Wash-up rooms? New additions? Peak periods? An Aldrich High-Delivery hot water heater supplies from 93 to 850 gallons an hour. Heating is direct, saves slow storage. And you save long piping runs, complex installations. Aldrich heaters are designed for low-cost efficiency, from either oil or gas. They need little space, can be put in existing buildings without major alterations... save space on new construction.

Write today for full specifications.

ALDRICH

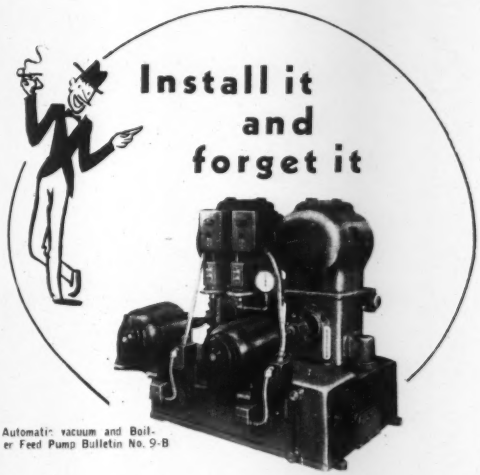
COMPANY

ALDRICH HEAT-PAK PRODUCTS

105 East Williams Street, Wyoming, Illinois

A subsidiary of Breeze Corporations, Inc.

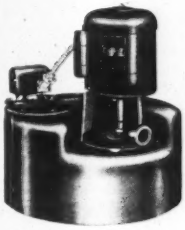
ANOTHER BREEZE MARK PRODUCT



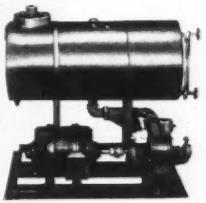
Automatic vacuum and Boiler Feed Pump Bulletin No. 9-B

. . . you can if it's a *Skidmore Pump*

Consider the Skidmore Automatic Vacuum and Boiler Feed Pump — it adjusts itself automatically to varying conditions of the systems — capacity remains constant year afer year, without adjustments or expensive repairs — operates quietly, economically and dependably under all normal conditions.



Type CV—Bulletin No. 21.



Type TM—Bulletin No. 17.

MINIMUM OPERATING PARTS

The Skidmore Pump is designed with minimum operating parts — easily accessible without disturbing piping connections. Constructed with bronze impeller. Switches and motors are of proper capacity. Yes, once you install a Skidmore Pump you can forget it! for your maintenance worries are over.

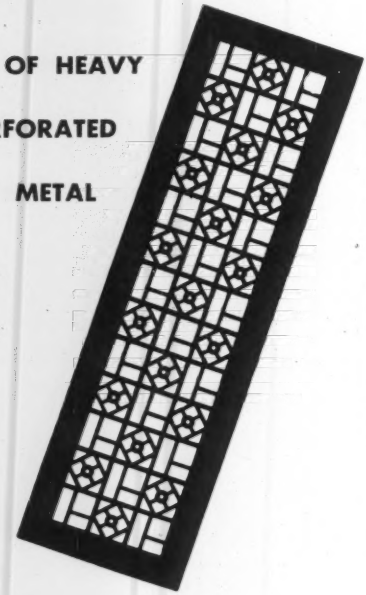
SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

There's a wide range of sizes and capacities for every heating pump need. Sales representatives in principal cities.

Skidmore Pumps

Ornamental Grilles

OF HEAVY PERFORATED METAL



Hendrick Ornamental Grilles are made by perforating metals ranging up to 3/16" in thickness. The designs are clean-cut, without burrs or other imperfections, and the grilles are uniformly flat and easy to install.

Over a hundred designs are available, many of the most distinctive being obtainable only from Hendrick. Each design can be furnished in a wide range of overall dimensions, bar sizes, number of perforations and size of perforations.

Write for full information.

SEE OUR CATALOG IN SWEET'S

Perforated Metals
Perforated Metal Screens
Wedge-Slot Screens
Architectural Grilles
Mitco Open Steel Flooring, Shur-Site Treads, Armorgrids

HENDRICK
Manufacturing Company
48 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

quarters in Pittsburgh; and *JOHN F. MUNDER*, new eastern region, offices in New York.

For *HARVEY-WHIPPLE, INC.*, Springfield, Mass. — *FRANK P. KIRK*, Manitowish, Wis., rejoins the company to be factory representative for all of Wisconsin and the eastern fringe of Minnesota. *LeROY O. GOUGH*, Bangor, Mich., is the new representative for both the lower and upper peninsulas of Michigan.

For *WESTERN ENGINEERING & MFG. CO.*, Los Angeles — new factory representative for Alabama and Georgia. *BROWNLEE-MORROW ENGINEERING CO.*, Birmingham.

For *J. H. WILLIAMS & CO.*, Buffalo — *E. G. BROWN, JR.*, representative, to assist the Philadelphia district manager.

For *QUAKER RUBBER CORP.*, division of H. K. Porter Co., Inc., Pittsburgh — new stock carrying branch warehouse and sales office at 260 Schuyler Ave., Kearney, N.J.

For *MITCHELL MFG. CO.*, Chicago—*HARRY WALKER*, 406 W. 34th St., Kansas City, Mo., to handle all the company's lines in greater Kansas City territory. New distributors for the company's window type room air conditioners are: *UNITED ELECTRICAL SUPPLY CO.*, 127-129 Third St., Parkersburg, W. Va.; and *WALDEN HEATING CO.*, 2557 15th St., Denver.

For *McQUAY, INC.*, Minneapolis — *DOMER H. THIELE*, Johnstown, Pa., is representative for air conditioning and heating products in the Pittsburgh territory.

ASTM Standards Supplements

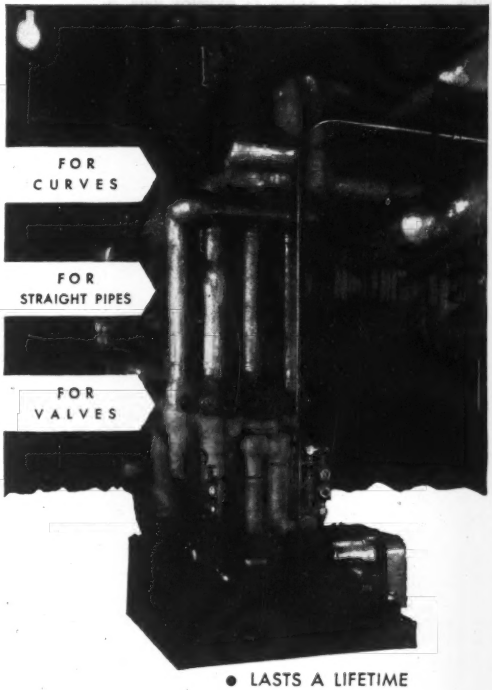
The 1951 *Supplements to the Book of ASTM Standards* give, in their latest form, all ASTM specifications, tests, definitions, etc., excepting the chemical analysis of metals.

Part 1. *Ferrous Materials* (416 pages) includes 51 standards covering steel piping materials (welded and seamless, high-temperature service, stainless, etc.); steel tubes (heat-exchanger and condenser; seamless and welded for low-temperature service, etc.); structural and plate; bars and bolting materials; boiler rivets; forgings; corrosion and heat resisting steels; etc.

Part 2. *Non-Ferrous Metals* (360 pages) includes 75 standards covering copper and copper alloys (wire, bars, and stranded conductors for electrical purposes; plate, sheet, strip, and rolled bar; wire, rod, bar and shapes; pipes and tubes; alloy castings); aluminum and magnesium alloys for castings, electrical heating, resistance and related alloys; electrodeposited metallic coatings; and general testing methods.

Part 3 (280 pages) covers thermal insulation, in addition to cement, concrete, ceramics, soils, etc.; and Part 5 (344 pages) covers fuels, as well as antifreezes, etc.

The supplements can be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $3.50 per part, or $21.00 for the set of six parts.



- LASTS A LIFETIME
- EASILY INSTALLED
- APPLIES WITHOUT WASTE

for Maximum Efficiency

SPECIFY ALL-HAIR

OZITE

INSULATING FELT

OZITE All-Hair Felt has been the best insulation for the refrigeration industry for over half a century. Here's why —

. . . low conductivity provides efficient heat barrier . . . allows close temperature control . . . permits maximum capacity of refrigeration units . . . reduces power consumption . . . does not rot or pack down — resists fire.

For all of the facts about time-proven OZITE send for 4-page Bulletin No. 300.

AMERICAN HAIR & FELT COMPANY
Dept. C27, Merchandise Mart
Chicago 54, Illinois

plain facts
you should know about ventilators . . .

fact 1 Although ventilators have long been selected primarily on the basis of capacity ratings, those ratings usually are based on *horizontal* wind tests only. *In actual use ventilators must perform with winds blowing at* ANY *angle.*

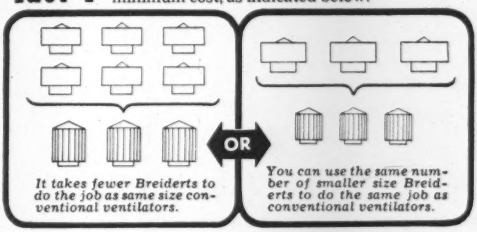
fact 2 Capacity ratings of most ventilators are not certified. Performance does not equal ratings claimed in some cases.

fact 3 Breidert Air-X-Hausters are the *pioneer* ventilators with published capacity ratings based on tests* made with wind blowing in *all* directions, as shown below.

Breidert Air-X-Hausters provide safe, sure ventilation no matter which way the wind blows (barring interior negative pressures). Stationary, no moving parts, nothing to jam or get out of order.

Patent No. 2269428

fact 4 The Breidert delivers better results at minimum cost, as indicated below.


OR
It takes fewer Breiderts to do the job as same size conventional ventilators.
You can use the same number of smaller size Breiderts to do the same job as conventional ventilators.

Get *all* the facts! Write today for complete Engineering Data Book, including certified capacity ratings. Address Dept. A

✔ Every businessman should read "Plain Facts and Simple Figures," written by G. C. Breidert. This thought-provoking article pertains to the problems of every American businessman. The first twenty lines will open your eyes! Write for a free copy.

THE G. C. BREIDERT CO.

3129 San Fernando Road, Los Angeles 65, Calif.
Representatives in principal cities throughout the U. S.

**By Pittsburgh Testing Laboratories*

NEW BOOKS & REPORTS

Industrial Heating

North American Combustion Handbook, a basic reference on the art and science of industrial heating with gaseous and liquid fuels, should prove of great value to combustion men and to those persons interested in the generation and application of heat in the process industries. In addition to a simplified explanation of combustion for the benefit of those who do not and cannot use a mathematical treatment of basic physics and chemistry, the book also presents such a treatment for those who do and can. The text then continues its engineering aspects with chapters on heat transfer and flow of fluids. There is also a chapter, as would be expected, devoted to fuels.

The three remaining chapters discuss oil and gas burner equipment, methods of combustion control, and systems of installation. The last topic, however, is confined to piping; design of furnaces is left to those who are concerned with the selection and application of burners to the varied and extensive industrial arts where this equipment finds use.

The central theme of the text is utility. The material has been selected and presented to meet the needs of the engineer or other person who wants to make a rapid selection of equipment, and who needs in compressed form the basic information to permit calculation from the variables that are involved, and then to design a suitable combustion system.

The book also contains a wealth of technical data, in the tables and charts. The editors are to be congratulated on having produced a volume of usefulness, containing 178 tables, charts and illustrations.

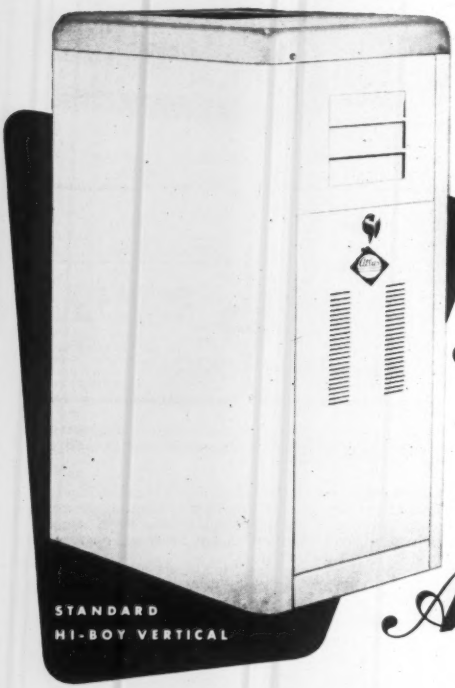
This 322 page book is available through the publisher, North American Mfg. Co., 4455 E. 71st St., Cleveland 5, at $2.00 a copy, plus postage.

— KALMAN STEINER

Steel Piping Materials

The 1952 edition of the *ASTM Specifications for Steel Piping Materials* contains in their latest approved form (as of late February, 1952) the 56 ASTM specifications for carbon-steel and alloy-steel pipe and tubing, including stainless. Materials covered include: pipe used to convey liquids, vapors, and gases at normal and elevated temperatures; heat exchanger and condenser tubes; and boiler, superheater and miscellaneous tubes. Specifications are given for castings; forgings and welding fittings; and bolts and nuts. Included also are the ASTM standard classification of austenite grain size in steels, with two sets of charts; and American Standards covering wrought steel and iron pipe, and stainless steel pipe.

New specifications cover seamless and welded steel pipe and tubes for low temperature service; seamless ferritic alloy steel pipe for high temperature service; forged or rolled carbon and alloy steel flanges, forged fittings, and valves and parts for low temperature service; ferritic and austenitic steel castings for high temperature service; and ferritic steel castings for pressure containing parts suitable for low temperature service.



ADD *Glamour*
to your
BOILERS AND FURNACES
with
ATTRACTIVE,
DISTINCTIVE

Atlas STEEL CABINETS

Attractive, tailor-made Atlas Cabinets have stream-lined rounded corners, modern hardware and are beautifully finished in oven-baked hammerloid in colors of your choice. There are no bolts or screws and it fits together smoothly and quickly, producing savings in installation costs.

Atlas Cabinets are built to your specifications. They will carry your name and trademark and not that of Atlas. We can produce a full range of all models.

Send Your Specifications for Free Cost Estimates to

Atlas MANUFACTURING CO.

EUSTIS AT ROBBINS ST • ST. PAUL 4, MINN.

✓ Check your needs . . .

- ☐ *Personnel*
- ☐ *Equipment Sales*
- ☐ *Equipment Needs*
- ☐ *Manufacturers Agents*
- ☐ *Lines, etc.*

Whatever your needs in any of the above classifications . . . you can solve them quickly with a classified advertisement. The space rates are reasonable and results are quick. Closing date — the tenth of the month preceding issue.

Send for this Useful Recent Volume

"CORRECT PRACTICE in INDUSTRIAL PIPING"

192 Pages — 8½" x 11" — $1.50

This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult problems encountered in different industrial plants were successfully worked out by piping experts.

Design, installation, operation, and maintenance . . . steam, air, gas, oil, process, water and refrigeration piping . . . piping in pulp and paper and steel mills, in automobile plants and breweries, in the food and chemical and textile industries, and in many other types of manufacturing plants are dealt with from many different angles.

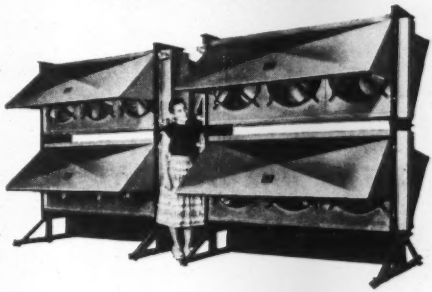
Send $1.50 today for this book to the address below.

KEENEY
PUBLISHING COMPANY

6 North Michigan Ave. **Chicago 2, Illinois**

¾ TO 100 H.P. CONDENSING ...without water!

ANY SIZE COMPRESSOR CAN BE AIR COOLED

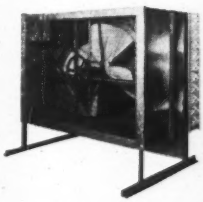


40 TON

with

UNICON*

by KRAMER



20 TON

Eliminates all water problems . . . because you don't use water with UNICON! Stands, hoods and wind deflectors are available for simplified outside mounting.

WRITE FOR BULLETIN U-210

*Patent Pending

KRAMER TRENTON CO.
Trenton 5, N.J.

Hospital in Montgomery, Alabama, equipped with No. 5 Lo-BLAST Burner

FOR EVERY TYPE OF BUILDING

LO-BLAST

IS THE GAS HEATING "BUY"

From coast to coast, you'll find Lo-BLAST Power-type Conversion Gas Burners heating buildings ranging from small residences to entire villages heated from a central plant. Preference for Lo-BLAST springs from proved efficiency, safety, durability . . . *operating records show an average saving of* 10%!

Compare these operating and construction features:

Power Burner Design. Perfect combustion, regardless of draft—a proved fuel saver. Safe and efficient for down-draft units.

Simple to Install. Every Lo-BLAST is factory tested on gas and shipped assembled.

Safe Operation. Lo-BLAST comes equipped with dependable, foolproof safetys.

Soft, Quiet Flame. No "pop" when the Lo-BLAST goes on or off—burns so smoothly you can hardly tell it's running.

Easy to Service. All parts are accessible—nothing in the firebox but the fire. Simplicity of design and durable construction reduce service to a minimum.

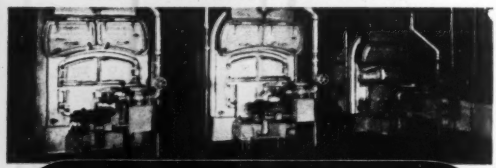
Long Lasting. Many Lo-BLAST Burners have been in operation 15 years without service.

Complete Capacity Range. Units available from 70,000 to 20,000,000 BTU input.

Lo-BLAST Economite

The "mighty-mite" of conversion gas burners—capacities from 70,000 to 500,000 BTU. All the famous design features of the larger Lo-BLAST packed into a low-cost unit for residential use. Write for descriptive literature.

This battery of Lo-BLAST Burners handles 11,000 sq. ft. of steam radiation plus 10,000 gallons of hot water per day.



MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

A number of emergency alternate provisions applying to these specifications are furnished with the volume. These provisions may be used during the period of national emergency where the purchaser of a material considers it a permissible alternate for the specific application involved.

This 384 page publication is available from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $3.50 a copy.

Bituminous Stoker Coals

The second edition (March, 1952) of *Tentative Standard Procedure for Testing and Evaluating Bituminous Stoker Coals* (sponsored by Bituminous Coal Research, Inc., and the Stoker Mfrs. Assn.) contains a revision of the method in the light of considerable experience by laboratories which have installed equipment for the test. Certain features originally specified have been found troublesome out of proportion to the worth of the data they might have provided. The procedure, therefore, has been considerably simplified, with many features now listed as optional. By agreement, the test program is to be broadened by inclusion of borderline and undesirable stoker coals to provide a basis for interpretive suggestions.

Copies of the edition are available from the sponsors, SMA, 307 N. Michigan Ave., Chicago 1, or BCR, 2609 First National Bank Bldg., Pittsburgh 22, at $1.00 a copy.

OTHER BOOKS AND REPORTS

DEFENSE CONTRACT PRICING, a report issued by the Dept. of Manufacture, U.S. Chamber of Commerce, proposes improvements in government contracting which the Chamber feels have long proved effective in ordinary commercial transactions. It covers both fixed-price and cost-reimbursement types of government contracts. The 19 page report can be obtained from the Chamber of Commerce, Washington, D.C., at 25 cents a copy (bulk order discounts available).

The rapid rate at which natural gas reserves are being used forecasts the need for using supplies of increasingly higher nitrogen content. Proposals have been made to remove parts or all the nitrogen prior to transmission, to increase pipeline thermal carrying capacity. Of added interest is the storage of natural gas as liquid, requiring separation of nitrogen in the liquefaction process. *PHYSICAL-CHEMICAL PROPERTIES OF METHANE-NITROGEN MIXTURES*, Institute of Gas Technology Research Bulletin No. 17, by O. T. Bloomer and J. D. Parent, offers vapor-liquid phase data on the methane-nitrogen system, necessary for engineering design of nitrogen-removal equipment. The studies reported have, since 1950, been sponsored by a committee of the American Gas Association.

This 35 page booklet is available from the institute, Technology Center, Chicago 16, at $3.50 a copy.

BOLT, NUT AND RIVET STANDARDS (second edition) contains current standards for commercial fasteners, includes a section listing weights and stock production sizes, and discusses screw threads, gaging practices, etc.

This 256 page book is available from the publisher, Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, at $3.00 a copy.

We need 3000 Carloads of Scrap a Day

Every pound of dormant scrap you can furnish will help to keep the steel mills and foundries producing

Steel mill furnaces are gobbling up scrap faster than it's being delivered. To maintain planned schedules of steel production for both military and civilian purposes, the mills must have *more* iron and steel scrap.

Get in the Scrap—Yourself!

Whatever your business, you undoubtedly have scrap. If there's dust on it or rust on it—it may be scrap. If it's scrap—it's *needed*.

Turn it over to your local scrap dealer and help lick this critical scrap shortage.

What you can do to help

1. Appoint one top official in your plant to take full responsibility for surveying the plant and getting out the scrap.
2. Consult with your local Scrap Mobilization Committee about its program to help out in the scrap crisis. The nearest office of the National Production Authority, Department of Commerce, can tell you who your local Scrap Mobilization chairman is.
3. Call in your local scrap dealer to help you work out a practical scrapping program. Non-ferrous scrap needed, too!
4. Write for free booklet, "Top Management: Your Program for Emergency Scrap Recovery", addressing Advertising Council, 25 W. 45th St., N. Y. 19.

FACTS YOU SHOULD KNOW ABOUT STEEL PRODUCTION

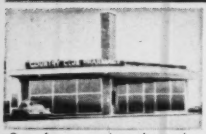
Steel production	1950	97,800,000 net tons
Estimated capacity	1952	119,500,000 net tons
Purchased scrap used*	1950	29,500,000 gross tons
Estimated purchased scrap requirement*	1952	36,200,000 gross tons

*All consumers

This advertisement is a contribution, in the national interest, by

Heating, Piping & Air Conditioning

THEY SAY:
"It's Air Conditioning at its very best"


One of many modern pharmacies that depend on Ready-Power.

More and more super markets are using Ready-Power.

The "Frida," a Banana Boat, is Ready-Power equipped.

The Casa Linda theatre saves many dollars with Ready-Power.

Ready-Power air-conditioning is ideal for churches

Wherever used, Ready-Power has met the test of operating efficiency to the full satisfaction of the user.

Ready-Power air conditioning equipment is planned and designed to meet the most exacting requirements with the lowest possible operating costs.

Ready-Power design permits *continuous* operation at varying speeds, which is far superior to "on and off" types. This means that the air conditioning system performs at reduced capacity allowing for a constant dehumidification of the fresh air supply.

The dependable and economical performance of Ready-Power has been proved in hundreds of installations. Names of users will be furnished on request.

READY-POWER
SAVES AS IT SERVES

THE READY-POWER CO.
11231 FREUD AVE. • DETROIT 14, MICH.

Manufacturers of Gas and Diesel Engine Driven Generators and Air Conditioning Units; Gas and Diesel Electric Power Units for Industrial Trucks.

MEETINGS & CONVENTIONS

IBR SCHOOL OF MODERN HEATING — August 19 to 21, Providence; August 26 to 28, Albany; September 9 to 11, Detroit; September 16 to 18, Saginaw, Mich. Sponsored by The Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17. The school is a three day course providing instruction in the design and installation of hot water and steam heating systems.

EIGHTH ANNUAL NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS — September 4 and 5, Sherman Hotel, Chicago. Sponsored by Illinois Institute of Technology, Technology Center, Chicago 16. It will be held in conjunction with the Centennial of Engineering.

INSTRUMENT SOCIETY OF AMERICA, 1319 Allegheny Ave., Pittsburgh 33 — Seventh national instrument conference and exhibit, September 8 to 12, Cleveland. The eighth national conference and exhibit will be held September 21 to 25, 1953, Chicago, and the first international instrument congress and exhibit will be held September 14 to 24, 1954, in conjunction with the ninth national conference and exhibit.

SEVENTH NATIONAL CHEMICAL EXPOSITION— September 9 to 13, Coliseum, Chicago. Sponsored by the Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1. An exhibit on atomic energy in industry will be part of the exposition.

AMERICAN INSTITUTE OF WHOLESALE PLUMBING AND HEATING SUPPLY ASSOCIATIONS, INC.— First national convention, October 19 to 22, Chalfonte-Haddon Hall Hotel, Atlantic City, N.J. For further information write G. T. Underwood, executive secretary, Room 402, Albee Bldg., 15th and G Sts., Washington, D.C.

AMERICAN GAS ASSOCIATION, 420 Lexington Ave., New York 17 — 34th annual convention, October 27 to 30, Atlantic City, N.J. An exhibit by the Gas Appliance Manufacturers Association will be held concurrently. The 35th annual convention will be held the week of October 26, 1953, in St. Louis.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 40 W. 40th St., New York 18 — 38th annual meeting, November 30 to December 3, Hotel Commodore, New York.

11th INTERNATIONAL HEATING & VENTILATING EXPOSITION — THE AIR CONDITIONING EXPOSITION — January 26 to 30, 1953, International Amphitheatre, Chicago. Held under the auspices of The American Society of Heating and Ventilating Engineers. Address inquiries to the exposition management, International Exposition Co., Inc., Grand Central Palace, New York 17.

NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION — 39th annual convention, December 3 and 4, Sheraton Gibson Hotel, Cincinnati.

"I urge every American employer to promote the Payroll Savings Plan..."

DECHARD A. HULCY, PRESIDENT
Chamber of Commerce of the United States

"I urge every American employer to promote the Payroll Savings Plan among his employees as a means of building a reservoir of savings."

As President of the Chamber of Commerce of the United States . . . with literally thousands of contacts throughout industry and commerce . . . Mr. Hulcy is uniquely qualified to evaluate the Payroll Savings Plan.

As a business man, Mr. Hulcy puts his finger on a most important accomplishment of the Payroll Savings Plan: the enormous reservoir of savings, *future purchasing power*, built up by systematic saving.

Today, millions of Americans hold Series E Defense Bonds totaling $34.7 Billion. It will surprise many to learn that this figure is $4.8 Billion greater than on V.J. Day. And the $34.7 Billion total of outstanding Defense Bonds is mounting as more and more employers recognize the importance of the Payroll Savings Plan. During 1951 there was a sizable increase in the number of men and women saving through Payroll Saving Plans where they work.

During the calendar year 1951, 45,500,000 $25 Series E Bonds were purchased — a gain of 17% over the previous year. 12,000,000 $50 E Bonds were purchased in the same period, 14% over the previous year. $25 and $50 denominations are the bonds bought by Payroll Savers.

Building a reservoir of savings and future purchasing power . . . contributing to America's defense effort . . . helping to maintain America's economic stability by providing a check on inflationary tendencies, the Payroll Savings Plan is doing a three-way job.

If your company hasn't a Payroll Plan, or if your employee participation is less than 60%, the Savings Bond Division, U. S. Treasury Department will be glad to help you take your place among America's Honor Roll of "Companies on Payroll Savings". Phone, wire or write to Suite 700, Washington Building, Washington, D. C.

The U.S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

Heating, Piping & Air Conditioning

RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 197. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending requests to Heating, Piping & Air Conditioning.

Air Conditioning Filters

HPAC 101—Bulletin 100 describes "Staynew" ventilation and air conditioning filters for removal of dust and other foreign matter by the impingement method — Dollinger Corp., 11 Centre Park, Rochester 3, N. Y.

All-Purpose, Integral Seat Valves

HPAC 102—Catalog describes "nivalve" integral seat, all-purpose forged steel valves, rated for 1500 and 2500 lb — Edward Valves, Inc., Dept. CU, 1200 W. 145th St., East Chicago, Ind.

Alternators for Pumps, Blowers, etc.

HPAC 103—Bulletin 7110 gives information on "Autocon Multiplex" alternators for automatically transporting starting sequence of 3, 4, 6 or 12 equally rated units — Automatic Control Co., 1005 University Ave., St. Paul 4. They can be used with pumps, blowers, compressors, burners, or any other units controlled by magnetic starters or two-wire circuits.

Altitude Control Valves

HPAC 104—Bulletin W-4 (16 pages) describes cushioned altitude control valves, discussing operating sequence and installation arrangements of the various single and double acting valves — Golden Anderson Valve Specialty Co., 2104 Keenan Bldg., Pittsburgh 22.

Aluminum Coiled Tube

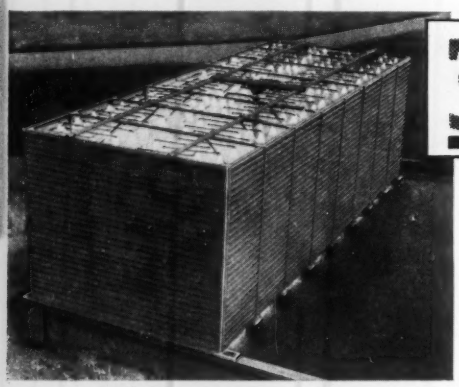
HPAC 105—Bulletin describes applications and installation procedure, and gives technical data on "Utilitube" aluminum coiled tube made of an alloy designed to provide easy workability and high fatigue strength — Aluminum Co. of America, Gulf Bldg., Pittsburgh 19. Applications include fuel lines, refrigerant lines, etc. Another bulletin discusses specific use of the tube in instrument lines.

Applications of Motors

HPAC 106—Booklet B-1769 gives over 100 case histories of applications of "Life-Line" motors in the chemical, petroleum, metalworking, and other industries — Westinghouse Electric Corp., Box 2099, Pittsburgh 30.

Attic and Industrial Fan

HPAC 107—Installation instruction folder covers a horizontal discharge attic and industrial fan for multiple storied dwellings, and large-space industrial and commercial use — Murray Co. of Texas, 3200 Canton Ave.,



30 standard sizes of Natural Draft Cooling Towers

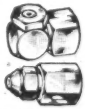
Binks Type "S" Cooling Towers are manufactured in capacity ranges from 15 to 1200 GPM. This wide range of sizes enables you to choose exactly the tower you need to fit your requirements without the needless expense of a custom-built unit.

Type "S" towers are recommended for processes where heat is liberated to circulating water. As an example, they're widely used to cool water from water-jacketed compressors, from refrigerating equipment, and from diesel engines.

Binks Type "S" standard large-capacity cooling towers are furnished in units up to two bays wide and twelve bays long. Capacity range of these standard units varies from 600 to 1200 GPM for normal cooling performance up to 10 degree temperature rise. Large capacity towers are fabricated to order. The tower illustrated above is one such special Type "S" tower. It is one bay wider than the standard units.

Send today for these bulletins
describing the complete line of Binks natural draft cooling towers. No obligation, of course:
Bulletin 30A—Single Section Towers, 15 to 125 GPM.
Bulletin 31A—Multiple Section Towers, 150 to 500 GPM.
Bulletin 32A—Large Capacity Towers, 600 to 1200 GPM.
Write to: Binks Manufacturing Company, 3118-3 W. Carroll Ave., Chicago 12, Illinois

Binks



EVERYTHING FOR WATER COOLING • NATURAL AND MECHANICAL DRAFT COOLING TOWERS • INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED DIRECTORY

ALSTROM

A Dependable Source for CUSTOM BUILT HEAT EXCHANGERS

guarantees top performance in...

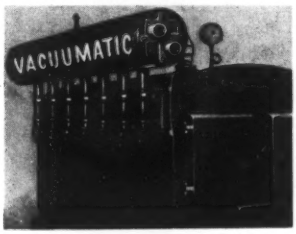
INDUSTRIAL • COMMERCIAL INSTITUTIONAL AND PUBLIC BUILDING INSTALLATIONS

Experienced Alstrom Engineering is your assurance of properly designed and constructed heating equipment—*in stock or tailor made to your specifications.* Alstrom Engineers can also provide you with expert on-the-job guidance.

APPROVED BY THE NEW YORK CITY BOARD OF STANDARDS AND APPEALS NO. 425-51-S.A.

"SAFE GUARD" OIL PREHEATER

A special purpose industrial heat exchanger which is completely "fuel-proof" and really heats oil, this ingenious "double-transfer" oil preheater contains a capillary transfer chamber between oil tubes and boiler water which ends contaminating of boilers and heating systems. The unit positively isolates leaking oil, yet effects rapid, efficient heat exchange. Full range of sizes.



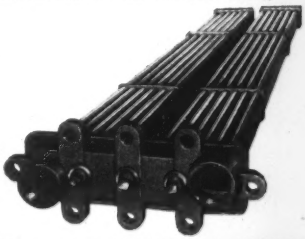
***Vacuumatic Instantaneous Heater**

"The World's Fastest Water Heater"

*Reg. U. S. Pat. Off.

Ideal for all steam heating boilers, this famous development of The Alstrom Corporation has been proven superior in thousands of installations. Write for booklet "The Vacuumatic Story"

SUBMERGED COILS . . . for every purpose



Send for detailed catalog No. 30

Manufacturers of: INDUSTRIAL HEAT EXCHANGERS • TANKLESS GENERATORS • STEAM HEATED INSTANTANEOUS WATER HEATERS • SUBMERGED HEATERS FOR COMMERCIAL STEEL BOILERS • HEAT RECLAIMERS

THE ALSTROM CORPORATION
790 East 176 St. • New York 60, N. Y.

THE EMPIRE STATE BUILDING

which dominates the New York skyline, is famous the world over as an architectural and engineering marvel.

When air conditioning was installed, the specifications included suppression of cooling tower noise, and the job was engineered by Industrial Sound Control, Inc., using ISC "Soundmetal" panels.

Whatever your noise problem, call on ISC —the originators of industrial soundproofing materials and methods. Its installations, completely engineered to solve the individual problem, range from test cells for the most powerful jet engines to soundproofing a small compressor.

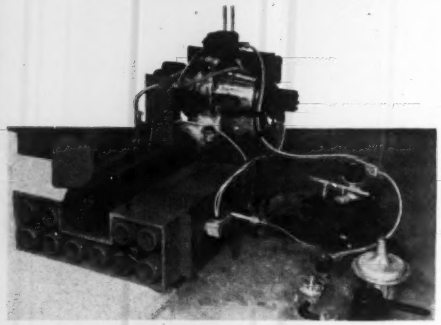
Write today for ISC's free booklet "Sound Facts."

Midwestern distributor: Midwest Industrial Sound Control, Inc., 1455 North Pennsylvania Street, Indianapolis 2, Indiana.

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.
2119 SO. SEPULVEDA BLVD., LOS ANGELES, CALIF.

WEBSTER COMBINETIC*
for Dual Fuel Firing



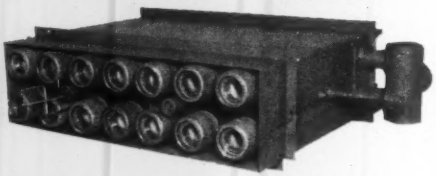
The WEBSTER COMBINETIC* now offers unsurpassed economy, efficiency and trouble-free operation in the combination oil and gas firing equipment field. Never before have both fuels been burned so well so simply.

You can rely on the usual WEBSTER quality to provide you with the best.

Both burners employ electric ignition; constant electric ignition on the oil burner, and electric ignition for the gas burner safety pilot.

•

WEBSTER KINETIC* BURNER



For Low Pressure Gas

The Webster Kinetic consists of a multiplicity of full venturi mixers with flame retention nozzles. These are assembled in a metal casing complete with pilot and louver. It may be used with natural, mixed or liquefied petroleum gases. Standby oil burners may be used when desired.

As a multiple head assembly it is available in 25 standard sizes of from 4 heads to 48 heads, and can be supplied in any size or shape. Natural gas input ratings from 560,000 Btu hr to 6,720,000 Btu/hr at 4" wc.

For complete information request Series B8 Bulletins.

** TRADEMARK*

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Dallas. The fan is available in five sizes, 24 to 48 in., with 1/3 to 3/4 hp motors.

Babbitting Practices

HPAC 108—Bulletin No. 146 outlines steps for the prevention of common bearing failures, covering aspects of babbitting practice from the choice of metal for a bearing application, through the correct pouring practice, to in-service maintenance — Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

Cabinet for Filing Blueprints, etc.

HPAC 109—Brochure describes and illustrates "Draw-In-Dex" cabinets for filing blueprints, tracings, drawings, charts, etc. — Empire Development Corp., 15 Park Row, New York 38. It is described as accommodating up to 1250 prints, which hang smoothly, are properly indexed and are immediately accessible.

Charts and Scale for Coil Selection

HPAC 110—"Sicromatic" charts and scale designed to make coil selection easier — Marlo Coil Co., 6135 Manchester Rd., St. Louis 10. In most methods for determining heat transfer surface requirements, several trials usually are necessary for a balance of surface capacity to load, and they involve the surface temperature, an elusive value. In this chart, according to F. Edward Ince, engineer for the company, this value has been eliminated. The chart gives a visual presentation of the trends or influence of a change in the variables as they affect the performance of the surface. Therefore, the possibility of error is limited to the setting of index points and the drawing of straight lines.

The left half of the chart indicates the air side capacity of the surface. The ordinate, labeled *wet bulb depression change factor*, is the difference between the leaving dry and wet bulb temperatures divided by the difference between the entering dry and wet bulb temperatures. Rows of coils are selected as their curves intersect the line indicating this *factor*, and within the *suggested range for face velocities*.

The right half of the chart, and the scale (printed on a ruler) indicate the load to be presented to the surface and the refrigerant temperature required to provide surface capacity. The scale shows air wet bulb and refrigerant temperatures.

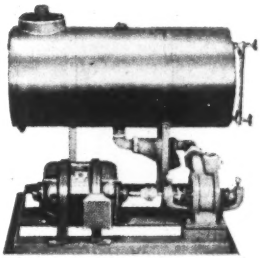
When used for surface selection with chilled water as refrigerant, the chart gives reference to *average water temperature*. When used for chilled water coil selection, the curves representing water velocity within the tubes are referred to. These curves then show the capacity performance of the surface.

Mr. Ince points out that the variables may be used at any increment amount on the charts to find a solution without using mathematical interpolation.

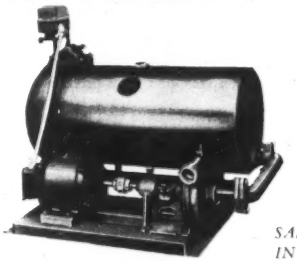
Cloth Tube-Type Dust Collector

HPAC 111—Vol. 1, No. 1, of *Dust and Fume Topics*, a new periodical, is devoted to applications of "Dustube" cloth tube-type dust collectors in dust and fume control — American Wheelabrator & Equipment Corp., 1321 S. Byrkit St., Mishawaka, Ind. Problems considered are lead oxide dust handling in the manufacture of storage

Like the dependable Skidmore Pump, which operates under all types of conditions, the men that build them are on the job too! Day in and day out, all types of Skidmore Pumps are flowing down the production line for defense and peace time orders. Whether your requirements call for the TM Turbine type pump or the HS Condensate Horizontal type pump, these and other Skidmore Pumps are on the job, performing dependably everyday.



Send for Bulletin No. 17 Type TM High Pressure Turbine Pump. Pressures up to 150 lbs. and boilers to 250 H. P.



Send for Bulletin No. 14-A Type HS Condensate Pump. Capacities from 1,000 to 65,000 sq. ft. E.D.R. Pressures from 10 to 75 lbs.

Write for Bulletins! Skidmore has a heating pump designed for every installation. Get the facts now!

SALES REPRESENTATIVES IN PRINCIPAL CITIES.

MANUFACTURING QUALITY PUMPS SINCE 1921

SKIDMORE PUMPS

ST. JOSEPH, MICHIGAN

WATER HEATERS OR CONVERTERS

- *Residential*
- *Commercial*
- *Industrial*

Especially designed to supply hot water requirements for heavy and peak intermittant demands. These water heaters, or converters supply hot water to radiant heating panels or hot water systems. Live or exhaust steam in the converters' shells heats the water flowing through the tubes. They are designed for a working pressure of 150 lbs. per sq. in.

There's a wide range of sizes and capacities for every water heating need.

Behind the technical lore of an M & L engineer lie thousands of successful Manning & Lewis installations in every type of residential, business and industrial building. Let this experience and knowledge knock the drudgery from your next tough job.

Fully describe your requirements when you write—your inquiry will receive prompt and courteous attention. Bulletin 780 is yours on request.

for

Industrial Plants **Apartment Houses**
Schools **Hospitals** **Laundries**
Hotels **Clubs** **Dormitories**
Public or Office Buildings

SALES REPRESENTATIVES IN PRINCIPAL CITIES

1908

Manning & Lewis Engineering Co.

M&L

32 Ogden Street Newark 4, New Jersey

HEAT EXCHANGE EQUIPMENT

We have the answer to your Oil Heating Problems

SUCTION TYPE TANK HEATERS

Installed at the base of bulk storage tanks, these heaters bring oil to the proper temperature for easy pumping. They heat the oil only as it is withdrawn, thus reducing radiation losses to a minimum. U-bend heating element and sheath are designed for easy installation into the storage tank by welding, riveting or bolting. Heavy gauge tubes welded to tube sheet assure long equipment life.

TYPE V-1 STANDARD OIL HEATERS

These heaters, built in four standard sizes, are maintained in stock at all times for prompt delivery. Heater incorporates straight tube bundle with tube sheet welded to shell, minimizing the number of joints. Type V-1 is designed for economy, simplicity, and ease of cleaning. No line connections need be broken to enter the tube circuit.

TYPE W OIL HEATERS

Special Whitlock expansion member compensates for differential expansion or contraction between shell and tubes. Standard sizes are designed for working pressures of 250 psi. on both shell and tube side, but can be supplied for higher oil or steam pressures when required. Straight tubes facilitate cleaning.

WHITLOCK

Find out about these and other Whitlock Oil Heaters. Write for Bulletin 35, or send specifications on your particular requirements. The Whitlock Manufacturing Company, 44 South Street, Hartford 10, Conn. In Canada: Darling Bros., Ltd., Montreal.

* * *

Whitlock Designs and Builds: bends, coils, condensers, coolers, heat exchangers, heaters, piping, pressure vessels, receivers, reboilers.

These two compressors, installed in a machinery penthouse on the 11th floor of the Pathé Television Center, New York, are now mounted on Korfund standard steel spring vibro-isolators. The structural steel saddles shown are not ordinarily required, but were used in this case so that original piping could remain unchanged.

...by controlling vibration

When originally installed, each of these two big compressors was mounted on 4 rubber-in-shear rails, which were not the proper isolation for the vibration frequency and floor conditions.

Consequently, vibration transmission through these "mountings" was so bad that it was impossible to use office space on the floor below, and vibration and noise transmitted through the building were picked up on film sound tracks several floors down.

Now, remounted on Engineered Korfund Spring Isolators, the job is entirely satisfactory and has been in operation for the last three years.

Korfund Engineered Vibration Control would have cost no more in the beginning.

A selector chart in Bulletin G-104 gives basic isolation recommendations for both normal and critical operating conditions for pumps, fans, compressors, refrigerating and other types of mechanical equipment. See Sweet's Catalog Files, or write us for your free copy today.

We'll gladly submit recommendations without obligation. A half century of experience is at your disposal.

THE KORFUND COMPANY, INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

41-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

batteries, wood dust collection, rock dust from aggregates plants, and mica collection in roofing manufacture.

Cooling Towers

HPAC 112—Bulletin 401-B illustrates and gives specifications for "Flow-Cold" cooling towers, available in six models and in capacities from 3 to 10 tons — Acme Industries, Inc., Jackson, Mich. Ratings at various wet bulb temperatures are given.

Dehumidification

HPAC 113—1952 bulletin, *A Few Facts about Dehumidification for Industry*, discusses what is meant by relative humidity, signs and results of too much humidity, etc., and describes a heavy duty dehumidifier and a number of humidity and temperature measuring devices — Abbeon Supply Co., 179-15 Jamaica Ave., Jamaica, N. Y.

Electric Heating

HPAC 114—File folder contains specifications of a complete line of electric heaters, with individual sections for industrial, farm and domestic heaters ranging from 1320 to 45,000 watts — Electromode Corp., 45 Crouch St., Rochester 3, N. Y. There are formulas for estimating the proper size heater, figuring heat loss, etc. Typical installations are shown, and price sheets are included. The folder is standard size for holding 8½ x 11 in. sheets.

Electrical Convection Heating

HPAC 115—Folder describes "Circle Air" electrical convector heaters — Paley Mfg. Corp., 244 Herkimer St., Brooklyn 16. Since electrical current is converted into heat, there is no need for burners, boilers, etc. A thermostat affords automatic room-by-room, or zone-by-zone control.

Exhaust Hood Design

HPAC 116—Bulletin 270-E1 (24 pages), *Manual of Exhaust Hood Design*, gives engineering data on dust control systems for the metalworking industries — American Air Filter Co., Inc., Louisville 8. It illustrates and discusses design of hoods for such operations as polishing, buffing and grinding, cast iron machining, etc. Typical installations are shown, and tables of exhaust requirements plus information on dust concentrations, weights of collected material and other data are included.

Fans for Exhausting Fumes or Gases

HPAC 117—Revised catalog DB-4-52 describes "Bifurcator" fans for exhausting fumes or gases which are abnormally hot, flammable or explosive — DeBothezat Fans Div., American Machine and Metals, Inc., East Moline, Ill. They are direct motor driven fans in divided housings, with the motor mounted in a separate chamber isolated from the gases. Specifications, dimensions and capacities are given for fans from 12 through 48 in. in diameter and handling up to 45,000 cfm of air.

Fin Pipe Catalog

HPAC 118—Eight page catalog contains information on design, selection and installation of fin pipe coils and covers for industrial, commercial and institutional steam or hot water heating — Kritzer Radiant Coils Inc., 2901 W. Lawrence Ave., Chicago 25.

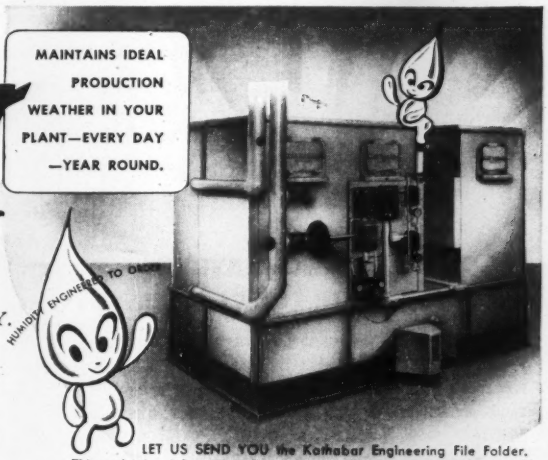
Kathabar

Humidity conditioning saves Haloid Co. $40,000.00 yearly!

The Haloid Company, prominent Rochester, N. Y. photographic paper manufacturer, installed Kathabar humidity conditioning equipment to supply dry air for *continuous* drying of photographic paper. Kathabar replaced conventional air conditioning equipment and *saves Haloid $40,000 annually.*

In addition to improving Haloid's product quality, Kathabar paid for itself in the first year.

MAINTAINS IDEAL PRODUCTION WEATHER IN YOUR PLANT—EVERY DAY —YEAR ROUND.



LET US SEND YOU the Kathabar Engineering File Folder. This and other information describes what Kathabar has accomplished to date. It may give you some idea on how you can profit from its use.

HP-7

☐ Send me the Kathabar Engineering File Folder.

☐ Send me information on.....
(Write here any special humidity problem you may have)

NAME.....

COMPANY.....

ADDRESS.....

CITY.....ZONE.....STATE.....

SURFACE COMBUSTION Corporation
TOLEDO 1, OHIO

Kathabar HUMIDITY CONDITIONING SYSTEMS
Surface INDUSTRIAL FURNACES AND BURNERS
Janitrol AUTOMATIC HEATING EQUIPMENT

Hotel St. Regis Chooses Sterling Quiet Motors

After extensive comparisons, Mr. F. Roullet, Chief Engineer of the St. Regis Hotel, New York City, selected Sterling Type FQ quiet operating motors to drive the fans of the hotel's air conditioning systems. Our service records prove Sterling motors are quieter and give highly dependable service, reports Mr. Roullet.

STERLING KLOSD MOTORS

OUTSTANDING FEATURES FOR BETTER AIR CONDITIONING:

...quiet operation—protected construction—streamlined design—cool running—direct through ventilation—prelubricated, double shielded ball bearings—NEMA dimensions—crossline starting—liberal connection space—dual voltage—vinyl acetal insulated wire in stator windings—molecular welded connections. Available with feet or footless, face or flange mounted, drip-proof or splash-proof.

WRITE FOR BULLETIN NO. FQ-112

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile
Offices and distributors in all principal cities

Fixture for Electric Radiant Heating

HPAC 119—Folder describes and illustrates the "Electriglas Thermolite" combination light and heating ceiling fixture — Appleman Glass Works, Inc., Bergenfield, N. J. It operates on 500 watts, and is 20 in. in diameter. A three-way switch gives separate control of heating and lighting.

Flow Meters

HPAC 120—Catalog 40 describes armored, variable-area "Flowrator" meters for high pressure flow rate measurement — Fischer & Porter Co., 6390 County Line Rd., Hatboro, Pa. They have new tapered metal metering tubes. The meters are designed for both high temperature and high pressure, and for use where liquid hammer and hazardous fluids are involved. Also covered are meter extensions and extension combinations.

Forced Air Heaters

HPAC 121—Folder describes Model 14 (gas) and 14E (electric) suspended "Speedheaters" for commercial and industrial installations — Kilbury Mfg. Co., 14529 Hawthorne Blvd., Lawndale, Calif. Capacities are 50,000 Btu with natural gas, 40,000 Btu with bottled gas, and 13 kilowatts (equivalent to 45,000 Btu) for the electric model. The latter is also described in a separate folder which, in addition, shows the company's cabinet models and the furnace as it may be used with ducts.

Four-Cylinder Compressors

HPAC 122—Bulletin No. 651-B (16 pages) describes and illustrates the various features of large four-cylinder compressors (enclosed-type construction) — The Frick Co., Waynesboro, Pa. Covered are such details as the crankcase, cylinders, capacity controls, safety cylinder heads, suction valves, bearings, etc.

Heat Pump

HPAC 123—Bulletin FT-50 describes the "Flow-Temp" heat pump, a single unit for both heating and air conditioning — Acme Industries, Inc., Jackson, Mich. It uses water as a heat source.

Hermetic Condensing Unit

HPAC 124—Condensed catalog C-52 covers the "Copelametic" hermetic condensing unit designed to provide accessibility — Copeland Refrigeration Corp., Sidney, Ohio. It includes information on remote air-cooled, remote water-cooled, self-contained air-cooled, self-contained water-cooled, combination air and water-cooled remote, extra low height self-contained and truck models. Specifications and capacities are tabulated.

High Pressure Pump

HPAC 125—Six page bulletin describes the "Triplex" self-contained, high pressure pump, showing standard applications calling for pressures up to 5000 psi — Kobe Inc., Div. of Dresser Equipment Co., Huntington Park, Calif. Also described are special applications where pressures up to 20,000 psi are needed. Specifications are given for the pump alone, and the pump with integral electric motor drive.

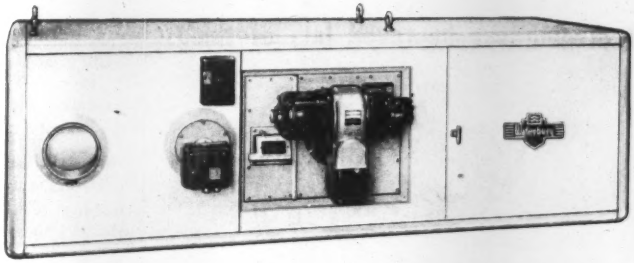
Humidity Conditioning

HPAC 126—Vol. 3, No. 1 of *The Humidity Engineer* covers application of humidity control to the manufacture

Sell Comfort...

SELL MORE USABLE FLOOR SPACE with the

Waterbury



Oil-Fired, Forced Warm Air SUSPENDED FURNACE

4 Sizes: 84,000 to 168,000 B.T.U. Output

A special unit is needed in situations where floor space is at a premium. This need has been met very successfully in the latest addition to the Waterbury line.

Commercial buildings, industrial plants, and certain types of homes require a warm air heating plant with the qualities of the Waterbury suspended furnace. A real space saver, it can be suspended in a crawl space under the floor, from the basement ceiling, in the attic, or in any portion of the building where more space is readily available at ceiling level than on the floor.

A "package" unit, assembled at the factory, the Waterbury suspended furnace has all parts accessible from the front, for easy inspection, cleaning and servicing. Air filters and a large capacity blower are standard equipment. This compact unit deserves serious consideration by owners, builders and men concerned with the maintenance of service stations and other commercial or industrial buildings.

Waterbury manufactures a complete line of furnaces and winter air conditioners, with a unit for every size home and every type of fuel.

The Waterman-Waterbury Co.
OVER 45 YEARS OF WARM AIR HEATING
1152 Jackson St., N.E., Minneapolis 13, Minn.

Manufacturers' Agents

Are you interested in securing additional lines?

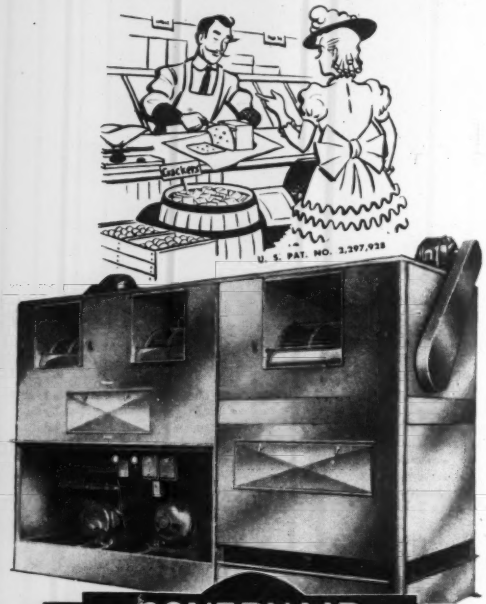
We are occasionally asked by our manufacturer advertisers to suggest the names of manufacturers' agents in various sections of the country whom they can contact in regard to representation of their industrial large building heating, piping and air conditioning products.

If you would like your name listed on our records for inquiries we may receive on your territory, we invite you to write us. There is no charge in connection with this service.

Heating Piping & Air Conditioning

6 N. Michigan Ave. Chicago 2, Ill.

Packaging has improved lots of things

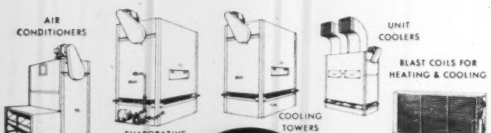


GOVERNAIR
ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS

Packaging makes many products more efficient, more convenient and more acceptable these days. And large size packaged air conditioners (up to 60 tons) are no exception!

That's why *so many* Governair Completely Packaged Air Conditioners are in use today. They are engineered and built by the pioneers of large size packaged air conditioning — *Governair!*

If you want a package deal that will do a better job of air conditioning for you choose Governair! Sized from 3 to 60 tons. GOVERNAIR CORPORATION, 513 N. Blackwelder, Oklahoma City, Okla.



GOVERNAIR

ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS!

of photographic film, and to the conditioning of a dance hall, and discusses the expansion of existing refrigeration cooling equipment — Surface Combustion Corp., Toledo 1, Ohio. Equipment manufactured by the company's Kathabar Div. is described. For copies, write direct to the manufacturer on company letterhead.

Industrial Scales

HPAC 127—Condensed catalog No. 11 (28 pages) features a complete line of scales for industrial use — The Howe Scale Co., Rutland, Vt.

Machines for Cutting, Crimping and Beading

HPAC 128—Folder illustrates and gives specifications for "American" cutting machine No. 20, crimping machines No. 21 and 23 and beading machines No. 22 and 24 — Charles E. Kraus Mfg. Co., 122 S. 8th St., Louisville 2.

Motors

HPAC 129—A number of new data sheets, replacing the previous corresponding ones, give dimensions, ratings, etc., of various types of motors — Century Electric Co., 1806 Pine St., St. Louis 3. Sheet 1-601 covers fractional horsepower motors (cushion base, sleeve and ball bearing, standard open and totally enclosed); sheet 6-315 covers squirrel cage induction motors (drip-proof, sleeve and ball bearing, direct drive); 6-321 covers wound rotor induction motors (sleeve and ball bearing); and 6-327 covers wound rotor induction motors (splash proof ball bearing).

Motors and Motor Controls

HPAC 130—Form 943 is a condensed price list for squirrel cage induction motors (normal and high starting torque), wound rotor induction, direct current, gear, and single phase motors — Century Electric Co., 1806 Pine St., St. Louis. Also covered are motor controls.

Oil-Fired Boilers and Other Equipment

HPAC 131—Eight page booklet describes a complete line of oil-fired equipment, including oil burners, water heaters, warm air conditioners, and boilers — Electrol Burner Mfg. Co., Inc., 22 Union Ave., Rutherford, N. J.

Packaged Pipe Nipples

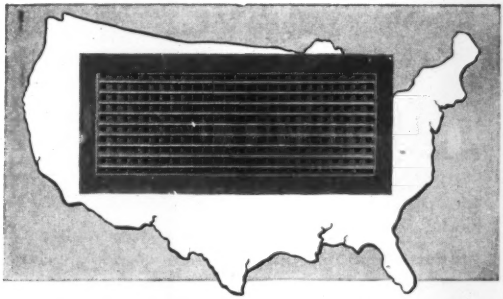
HPAC 132—Catalog N-5 introduces a line of packaged pipe nipples — Pittsburgh Nipple Works, Inc., 1455 Spring Garden Ave., Pittsburgh 12. All pipe nipples, tank nipples, right and left nipples, long screws and gauge syphons in steel, brass and copper are included in the company's packaging program, adopted in accordance with specifications of the National Bureau of Standards.

Perforated Metals

HPAC 133—Catalog 80 covers various types of perforated metals for use as filters, air intakes, machine guards, acousticals, etc. — Erdle Perforating Co., Inc., 177 York St., Rochester 11, N. Y. Described and illustrated are round hole perforations, slots, ornamental designs, special dies, square perforations, etc.

Plastic and Fiber Glass Reinforced Tubing

HPAC 134—Four page brochure contains engineering information on lightweight, corrosion resistant, thermosetting plastic and "Fibreglas"-reinforced tubing, for



From Coast to Coast!

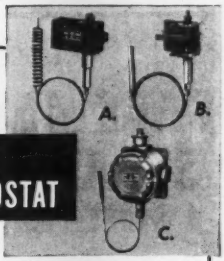
STEWART High Velocity Outlets are used for QUIET DIRECTIONAL air distribution.

We would like to supply your needs, too!

There are qualified representatives in principal United States cities — in Canada, Douglas Engineering Co., Ltd. Montreal — or write direct to factory.

Stewart MFG. CO., INC.
CEDAR GROVE
NEW JERSEY

100



A. TYPE E5

B. TYPE F42

C. TYPE E98

AN ACCURATE ADAPTABLE THERMOSTAT

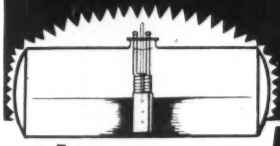
The type E5 thermostat is a precision-built temperature control which can be fitted with a wide variety of thermal assemblies and switches to suit the particular application. Temperature limits -150° F to +600° F.

The type E5 has been used on ovens, water baths, incubators, hot plate presses, cooling cabinets, air conditioning equipment, food and drink vending machines. Shown are three variations, the E5 covered by bulletin #3-2, Type F42 "skeleton" model covered by bulletin #3-3, and Type E98 in explosion-proof housing covered by bulletin #3-5. Write for information on the models of interest to you.

UNITED ELECTRIC CONTROLS COMPANY
87 School Street, Watertown, Mass.

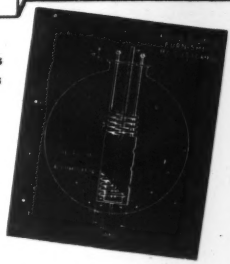
STANDARD & SPECIAL THERMOSTATS & PRESSURE SWITCHES

PREHEAT HEAVY OILS IN STORAGE TANKS



REMPE "Hot Spot" PREHEATER

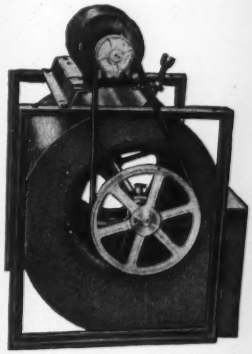
Preheats fuel oils and other liquids to proper flow temperature before entering the suction line.



No. 5 and Bunker C oils flow more freely at high temperatures—have greater BTU value. The Rempe "Hot-Spot" does the preheating job efficiently. Takes the load off the suction pump. All-steel construction. Inlet and outlet pipes furnished in required lengths for any diameter tank. Steam or Hot Water can be used as heat source. Made with 14" or 16" diameter shell.

Write for details and price

REMPE COMPANY
342 N. Sacramento Blvd., Chicago 12, Ill.



THE *NEW* UNIVERSAL TYPE "N" BLOWER

MASSACHUSETTS . .

By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

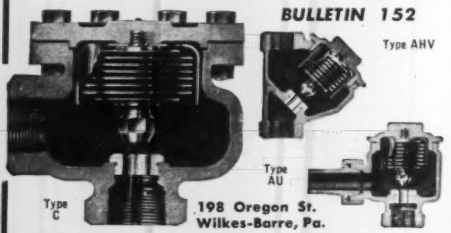
MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4901 HAMILTON AVENUE · CLEVELAND 14, OHIO

NICHOLSON TRAPS

SAVE 4580 LBS. OF STEAM PER CYCLE

A west coast lumber firm reports that substitution of Nicholson traps for a mechanical type effected a cyclic saving per kiln of 550 gallons of condensate, or 4580 lbs. of steam. See why leading plants are increasingly adopting Nicholsons for advanced features: operate on lowest temperature differential; 2 to 6 times average drainage capacity. 5 types; sizes ¼" to 2"; press. to 250 lbs.

BULLETIN 152



198 Oregon St.
Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

MEET THE NEW MODEL

MUCKLE VENTS

Take a look at the new silhouette . . . . it's low slung and streamlined — better looking on any roof!
Get away from old, "eye sore" ventilators — get the newly designed Muckle Vents. Engineered for better performance in moisture laden air — the motor is out of line of air flow. A compact, good looking, easy to install all-in-one unit to fit any roof.

Some territories open for sales representatives

WRITE TODAY FOR MORE INFORMATION ON MUCKLE VENTS.

Muckle MANUFACTURING CO.
OWATONNA 8, MINN.

defense and commercial applications — Dept. A-9, Reflin Co., 8525 Higuera, Culver City, Calif. The manufacturer states that it has a high strength-to-weight ratio, and recommends it for underground conduits, fuel, natural gas, irrigation or sanitary lines, etc.

Prefabricated Pipe and Tubing

HPAC 135—Folder (six pages) shows uses for, and various shapes and forms of prefabricated tubing — The Sawhill Mfg. Co., Sharon, Pa.

Production of Steel Pipe

HPAC 136—*Continuous Weld Pipe* tells the story of steel pipe production at a continuous weld pipe mill — Wheeling Steel Corp., Wheeling, W. Va. It follows the pipe-making process from molten iron in converters to warehousing and shipping.

Propeller Fans

HPAC 137—Bulletin No. 100 describes five types of 30 to 48 in. portable fans and 20 models of 27 to 72 in. exhaust fans — The Manufacturers Equipment Co., 278 Madeira Ave., Dayton 4, Ohio. Although the company specializes in clay-working equipment, the fans are applicable to general cooling and ventilating purposes where large volumes of air are to be moved. Direct connected motors range from ¼ to 50 hp; capacities range from 6250 to 140,000 cfm free air. Capacities against ⅛ to 2 in. static pressures are rated for the exhaust fans.

Protective Coatings

HPAC 138—44 page catalog describes Gilsonite base protective coatings for preventing corrosion of industrial

For Maximum Break-up at Lowest Pressures...

MARLEY NON-CLOGGING **SPRAY NOZZLES**

one-piece — designed for large capacity service.

two-piece — an all service nozzle that can be easily cleaned without removal from pipe.

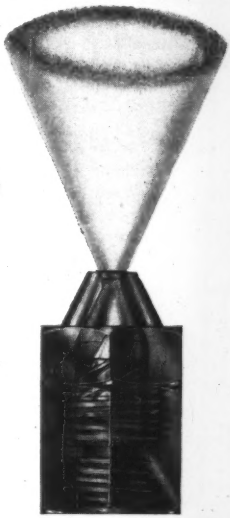
atomizing — a real mist-maker that leaves no unbroken drops of water.

Marley nozzles are manufactured for the air conditioning, refrigeration and processing industries by the Marley Company, world's leading producer of water cooling equipment. Write today for Bulletin SN3-51.

MARLEY **The Marley Company Inc.**

Kansas City 5, Missouri

DELAVAN TYPE WS SPRAY NOZZLE



— ideal for unusual spraying applications:

Cooling Towers
Brine Sprays
Degreasing
Bonderizing

and many other industrial uses.

WRITE TODAY FOR

Catalog 31

DELAVAN MANUFACTURING CO.
3009 SIXTH AVENUE
DES MOINES 13, IOWA

WHY WASTE WIND POWER:

The WESTERN ROTARY ventilator continues to exhaust during wind lulls by kinetic energy.

Lifetime guaranteed bearings—bearings that stay in alignment. Both bearings mounted on same axis. Long-lasting metallic-leafing paint finish on durable galvanized steel. Clean, low modern silhouette, completely functional. Throat sizes 6" thru 48" . . .Order today from your wholesaler. Write for prices, specifications, other information. In 1952 Sweet's, A.E.C., Heating, Ventilating & Air Conditioning Guide.

"always on the job—never on the payroll"

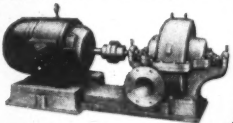
WESTERN ENGINEERING & MFG. CO.
4118 OCEAN PARK AVENUE, VENICE, CALIFORNIA

Faithful Performance on Important Jobs

— such as water supply, brine circulation, booster service, white water and overflow, hot well, makeup water, etc., etc.

Capacities to 1,200 G.P.M.

Heads to 460 Ft.



PUMPS "by Aurora"

TYPE-AD Aurora Horizontally Split Case, Back-to-Back Impellers, Two Stage Centrifugal Pump. Particularly suited to clear water and low viscosity liquids not containing solids. *Write for* BULLETIN 106

For Every Purpose

APCO TURBINE-TYPE PUMPS are unbeatable on low capacity, high head duties.

Capacities to 150 G.P.M. Heads to 500 Ft.

AURORA CENTRIFUGAL PUMPS are available in many types and sizes —all noted for their streamline coordination between impellers and shells.

Write for CONDENSED CATALOG "M"

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS — AURORA PUMP COMPANY

80 Loucks St., Aurora, Illinois

Made especially for YOUR job!

Ro-Fin Tubes

- Straight Lengths
- Custom Designed Coils
- U-Bends
- Unusual Combinations

ROME EXTENDED SURFACE HELICAL FIN TUBING comes in many sizes, some suitable for use with standard flare connections. Fins are solder bonded for permanent integral contact. Used extensively for building refrigeration condensers, blast air cooling or heating coils, inter-coolers and after-coolers, dry cleaning recovery coils. Write for details.

ROME
TURNEY RADIATOR COMPANY

209 Canal Street — Rome, New York

FOR
SPEED AND ECONOMY
INSULATE
WITH
Miracle
SURFACE ANCHORS AND ADHESIVES

Miracle Surface Anchors bonded with Miracle Adhesives provide firm anchorage for all types of Insulation. This includes Batt, Fiber Glass, Foam Glass, Cork, etc. to ducts, walls, or ceilings. No drilling, welding, bolts, screws or other mechanical means of attachment required. Miracle Surface Anchors are available in a variety of shapes and sizes to accommodate the particular job, and have been endorsed by leading Insulation Contractors and Architects everywhere because of their labor and time saving features. For information write:
Dept. HPAC-5-51
MIRACLE ADHESIVES CORP.
214 E. 53rd St., New York 22
For anchors write
DEVICES, INC.
214 E. 53rd St., New York 22
Distributed Coast to Coast — and in Canada.

equipment, especially in chemically contaminated atmospheres, and which acts as a weather or vapor barrier over thermal insulation — Insul-Mastic Corp. of America, 1141 Oliver Bldg., Pittsburgh 22. Related products such as membraning material also are covered.

Resistors

HPAC 139—Revised catalog on "Vitrohm" resistors, replaces bulletins 11, 19, 23, 24 and 25 in the company's binder — Ward Leonard Electric Co., 115 MacQuesten Parkway South, Mt. Vernon, N. Y. Covered are stock resistors, made-to-order resistors, and terminals, mountings and enclosures.

Safety Relief Valve

HPAC 140—Bulletin No. 290 describes the new Type F-51 ASME approved safety relief valve for hot water boilers, tanks and heaters — A. W. Cash Valve Mfg. Corp., 666 E. Wabash Ave., Decatur, Ill. At 30 lb psig set pressure, capacity is 720,900 Btu per hr. says the maker.

Smoke Control

HPAC 141—Bulletin 521 describes smoke controls for guarding against panic and damage from smoke accidentally introduced into the air intake of air conditioning systems — Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J.

Smoke Recorder

HPAC 142—Bulletin 512 (two pages) describes a smoke recorder for the use of plant and combustion engineers interested in recording stack smoke density and

G&O
COILS
for
HEATING and COOLING

G&O
RADIATION

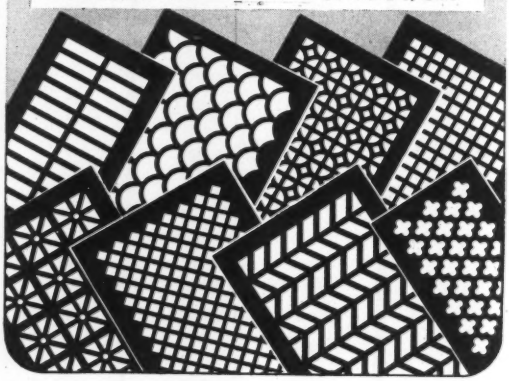
A full line of sizes now available
to meet all industrial requirements.
Send for catalog.

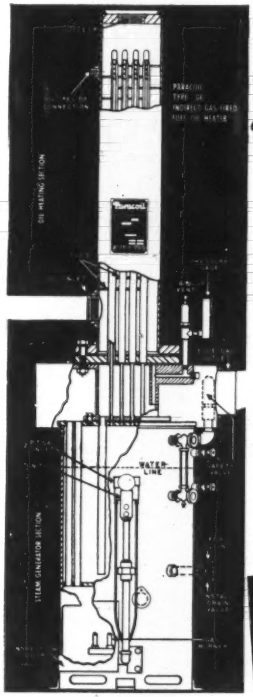
THE G&O MANUFACTURING COMPANY
New Haven 8, Connecticut
Pioneer Manufacturers of Square Finned Tubing in the United States

AUER GRILLES

Heating, air conditioning and plumbing contractors and engineers receive expert service from Auer on perforated metal grilles. The Auer line includes a variety of attractive designs for all purposes — air conditioning, ventilating, radiator enclosure, or concealment. We furnish almost any size, to your order, and in all available materials. Order Auer grilles by name and number. Send for bulletin showing all designs.

THE AUER REGISTER COMPANY
6600 Clement Ave. Cleveland 5, Ohio





A GREAT NEW DEVELOPMENT IN OIL PREHEATER DESIGN

Paracoil Keeps Pace With The Rapidly Changing Needs Of The Oil Burner Industry

The TYPE "GF" INDIRECT GAS FIRED FUEL OIL HEATER

A RADICALLY NEW APPROACH TO THE PROBLEM OF ADEQUATE OIL PREHEATING UNDER ALL OPERATING CONDITIONS!

The Type "GF" Oil Heater is an integrated self-contained steam vapor generating exchanger using gas as its primary heat source.

However, the gas flame does not come in contact with the tubes containing the fuel oil. Instead, vapor from the lower steam generating section does the actual oil heating!

APPLICABLE TO ALL TYPES OF OIL FIRED APPARATUS!

As it is not dependent upon the unit it is servicing for the means of heating the oil, the Type "GF" Heater can be applied to any oil fired apparatus, be it a steam or hot water boiler, a process oven, a dryer or a kiln!

A COMPLETE SOLUTION TO THE OIL-IN-BOILER PROBLEM!

As the Type "GF" Heater is in no way connected to the steam or water space of any boiler it may be serving, there can be no possible contamination of the boiler heating surfaces in the event of an oil leak in the heater.

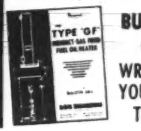
CHECK THESE FEATURES!

Completely factory assembled • Easy to install anywhere, even outdoors • Requires only minimum of floor space • Economical to operate • Wide range of oil heating capacities • Burns any specified type of gas fuel • High oil temperatures at all times • Operation unaffected by normal variation in viscosities of oils being heated • Reduces oil consumption through improved fuel combustion.

THE PERFECT HEATER FOR:

- Low temperature forced hot water heating systems on No. 6 oil.
- Plants with starting difficulties after week end shutdowns.
- Supplementing inadequacies in present oil preheating systems.

Approved by Board of Standards and Appeals, City of New York—Cal. No. 362-51SA



BULLETIN 60-L
WRITE FOR YOUR COPY TODAY!

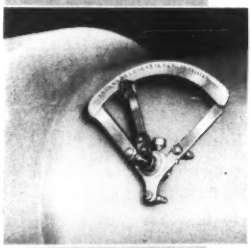
DAVIS ENGINEERING CORPORATION
30 ROCKEFELLER PLAZA NEW YORK 20, NEW YORK • 1064 EAST GRAND STREET ELIZABETH 4, NEW JERSEY

SAVE with Fuelguard

fuel...time...money

HEAVY DUTY DAMPER REGULATOR

IT'S SAFER... BETTER LOOKING... MORE ECONOMICAL... DOES A BETTER JOB



Easy-to-install FUELGUARD helps prevent fuel waste by making possible precision-adjustments (for control of drafts in medium to large boilers). Universally adaptable to all installations (manual or automatic controls). Let FUELGUARD "go to work for you."

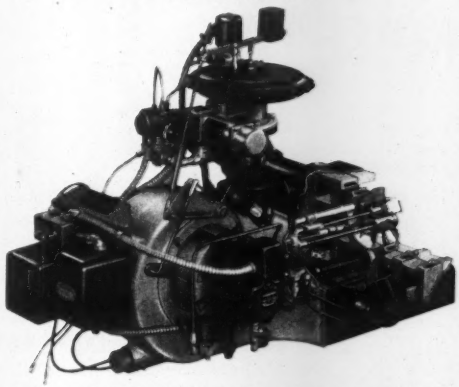
Damper - positioner Quadrant with lubricated bearings, indicating scale, locking device.

For full details write to Ashcraft

Fuelguard
5643 Dyer St. - Dallas

NOW— "FAN-AIR" MGO-3-D3 COMBINATION GAS AND OIL BURNER

25 - 50 - 100 HP



Presenting the (MGO-3-D3) fully automatic mechanical draft **combination GAS & OIL BURNER** with dependable Electronic Flame Failure Protective devices for **Both Fuels.**

A simple **"flip of the switch"** or automatic remote control, changes from GAS to OIL or in reverse. It's an exclusive METTLER design. **Nothing else like it on the market.**

Write for BULLETIN No. 12-S

THE METTLER CO., INC.
(Note New Address)
4366 Worth Street, Zone 63, Los Angeles, Calif.

KEYNOTES

"OOPS! I forgot how fast these old joints *let go*—with Key Graphite Paste on 'em."

The perfect seal for oil, gasoline, high-pressure steam.

Try a FREE sample! Write today

SEALS TIGHT... BREAKS RIGHT!

A Product of KEY COMPANY

2617 McCasland · East St. Louis, Illinois

combustion performance — Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J. Wiring and installation diagrams are included.

Sodium Zeolite Softeners

HPAC 143—Publication 4520-A (revised) explains zeolite water softening, and describes a hydromatic single control valve — Cochrane Corp., 3131 N. 17th St., Philadelphia 32. The valve is six individual valves in one, replacing the usual "valve nest."

Spreader Stokers

HPAC 144—15 page booklet illustrates, describes, and gives specifications for a dumping grate type and the "Travagrate" (moving grate) type of spreader stoker — Erie City Iron Works, 1450 East Ave., Erie, Pa. A feeder control for use with the stokers also is covered.

Squirrel Cage Induction Motors

HPAC 145—Bulletin 51B6210D gives construction features, ratings and dimensions of open drip-proof (Type AP) and splash-proof (Type APWW) squirrel cage induction motors in ratings of ½ to 100 hp — Allis-Chalmers Mfg. Co., 1171 S. 70th St., Milwaukee, Wis.

Steam Generator

HPAC 146—Bulletin 2000 (26 pages) discusses the design features, and other details of a self-contained, unit steam generator with a size range from 20 to 600 hp, for pressures up to 250 psi — Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23. Among the features de-

STOP NOISE

SCIENTIFIC NOISE CONTROL

SILENCES disturbing noises from —

Air Conditioning Systems
Power Plants • Boiler Rooms • Machinery • Stacks
Air Intake & Exhaust Systems • Power Generators
Transformers • Fans • Compressors • Cooling Towers
Vacuum Pumps • and many others

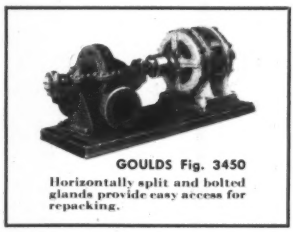
Improved Efficiency • Employee Morale • Public Relations

Write today for complete information

INDUSTRIAL ACOUSTICS COMPANY, Inc.

333 JACKSON AVENUE, NEW YORK 54, N. Y. • CYPRESS 2-2722

Keep costs DOWN... efficiency UP with this



GOULDS Fig. 3450

Horizontally split and bolted glands provide easy access for repacking.

Single-Stage Centrifugal Pump

For: Circulating and Booster Service

If you are looking for economy plus efficiency, it will pay you to specify Goulds Fig. 3450 Single-Stage Centrifugal Pumps. These low-cost pumps offer high-efficiency service with relatively low power consumption. Their simple, sturdy construction assures long life and low maintenance. Capacities to 15,000 G.P.M. Heads to 500 ft. Write for Bulletins 721.1 and 721.2.

Goulds PUMPS INC.

Seneca Falls New York

INDUSTRIAL THERMOMETER NO. A12403½

SELF-OPERATING REGULATOR SERIES 90000

DIAL THERMOMETER NO. V80200

STEAM TRAP NO. 2-¾"

Need Help?
Try **TRERICE!**

● You can save money, get extra efficiency when you install Trerice temperature instruments. You'll find a spot for an easy-to-read industrial or dial thermometer on water and refrigeration lines, on hot water tanks, and on air ducts. You can place a quick-acting temperature regulator on a hot water storage heater, on an instantaneous heater, or on an oil preheater. And, for low maintenance costs, you can install a rugged Trerice trap on steam lines. It all adds up to top efficiency in any heating or refrigerating system. Write for a catalog, or information on any item shown.

H. O. TRERICE CO.
Since 1923
Manufacturers of
TEMPERATURE INSTRUMENTS
1426 W. LAFAYETTE BLVD.
DETROIT 16, MICHIGAN
Branches in principal cities

SPRAY NOZZLES

. . . FOR EVERY NEED!

CLIP AND MAIL

For lower cost and more efficient spraying try Spraying Systems Spray Nozzles. Complete type and size selection for every need. Write for Catalogs.

SPRAYING SYSTEMS CO.
3219 Randolph Street • Bellwood, Illinois

☐ Send me Catalog No. 22 ☐ Send me Catalog No. 23

Name_____
Company Name_____
Address_____
City_____ State_____

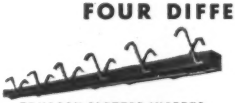
TRUSCON PRESSED STEEL INSERTS
—the domestic engineering contractor's answer to the problem of:

anchoring . . . . pumps, tanks, and all other similar types of service equipment.

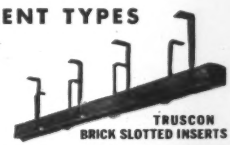
fastening . . . . . motors, meters, blowers, etc., to walls and columns.

suspending . . . pipes, pipe galleries and conduits from ceilings, walls or columns.

FOUR DIFFERENT TYPES



TRUSCON SLOTTED INSERTS



TRUSCON BRICK SLOTTED INSERTS

TRUSCON ADJUSTABLE INSERTS

TRUSCON TAPPED INSERTS

Truscon Pressed Steel Inserts are placed in the correct, desired position BEFORE the concrete is poured. Saves time, labor, money. Assures correct placement of fixtures and easy, quick changes.

WRITE FOR ILLUSTRATED LITERATURE!

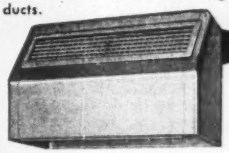
TRUSCON STEEL COMPANY
6214 Truscon Ave., Cleveland 4, Ohio • *Subsidiary of Republic Steel Corporation*

Lipman **"CONVERTIBLE" AIR CONDITIONER**

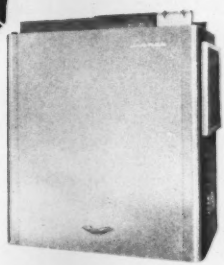
HOLDS DOWN INVENTORY, UPS SALES POTENTIAL

Install this Top for *Home* Installations

This duct top permits easy attachment of the basic unit to the forced warm air heating ducts.



Stock the basic unit, plus the "home" top and the "commercial" plenum top and you have two air conditioners in stock — sell your first prospect—double sales potential!



Install this Plenum Top for *Commercial* Installations

This plenum top makes a commercial unit that looks well, fits well, and operates efficiently in any surroundings. Low height of complete cabinet (only 60") makes it extremely popular.

Yates-American
BELOIT, WISCONSIN

DIRECTOR OF ENGINEERING

For young, aggressive, flexible, successful organization specializing in the most promising, fastest growing segment of the air conditioning industry. Require engineering degree and ten years experience in "package" air conditioning and/or refrigeration plus proof of successful administrative experience, imagination and sound judgment. Age 35-45; salary, open. Rapid growth requires man who can expand department soundly and qualify for engineering vice-presidency. Activity includes principally contemporary civilian products plus some essential military development work and forward-looking "post-emergency" projects. Communicate in confidence with Herbert L. Laube, President, Remington Air Conditioning Division, Auburn, N. Y., Telephones: 3-7373 or 3-3706.

scribed are staggered tubes, four-pass gas travel construction, anti-stress deck, etc. A combination gas and oil-fired unit also is covered.

Tachometers

HPAC 147—Technical data sheet No. T4 describes principle of operation of hand, portable, and fixed installation tachometers — Metron Instrument Co., 432 Lincoln St., Denver 9.

Time Switches

HPAC 148—Catalog TS-31 describes the Series TS66 "Inter-Matic Skipper" time switch for control applications where it is desired to skip operation of the time switch on Saturdays, Sundays, holidays, or other selected days — International Register Co., 2624 W. Washington Blvd., Chicago 12.

Valve Air Outlets

HPAC 149—6 in. plastic ruler on the back of which is indicated the actual sizes of valve air outlets — Gorton Heating Corp., Cranford, N.J. Shown are five sizes for radiators and two for mains.

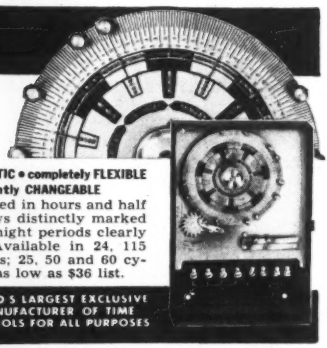
Wire Brushes

HPAC 150—Bulletin lists 56 standard precision-made single and double spiral wire brushes for use in industry — Mill-Rose Co., 1985 E. 59th St., Cleveland. Some special sizes and shapes also are shown.

Here's how to CUT YOUR CUSTOMERS' FUEL BILLS

Always Install a PARAGON 700 Series 7-Day Calendar Time Switch

When you install a 700 Series Time Switch on a heating job, you insure economical operation — and customer satisfaction. For example, it's simple to set the dial to switch to a lower thermostat setting *automatically* Saturday noon, then switch back to the higher setting earlier than usual Monday. At the same time a regular switching schedule for night shutdown of the heating system can be maintained the rest of the week. You can accurately set operations from ON to OFF or from OFF to ON as close as 3 hours apart . . . at *different* hours each day if necessary . . . or you can omit any days desired. You can set it in advance for automatic control of a week's operations — yet make changes instantly when necessary! Send for complete details — now! Ask for bulletin No. HP-5207.



• fully AUTOMATIC • completely FLEXIBLE • instantly CHANGEABLE

Dial graduated in hours and half hours — days distinctly marked — day and night periods clearly separated. Available in 24, 115 and 230 volts; 25, 50 and 60 cycles. Prices as low as $36 list.

PARAGON ELECTRIC COMPANY
TWO RIVERS, WISCONSIN

TWO RIVERS, WISCONSIN

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TIME CONTROLS FOR ALL PURPOSES

ROUND OR SQUARE DUCTS . . . it's all the same to FLEXIBLE *Cellufoam.* Fast fitting — Cellufoam is shears cut, covers small curves or square corners—no gapping or bulges. Easy to apply. Over ten years use has proven Cellufoam to be a low cost, efficient duct insulation.

Low in Cost—High in Efficiency
Airtex Corporation
333 N. Michigan Ave., Chicago 1
WRITE FOR FULL DETAILS ON

Cellufoam

Low Heat Loss YELLOW JACKET! STEEL ARMOURED INSULATED PIPE

transmits refrigerants, hot water or steam . . . through underground or exposed locations

PREFABRICATED • PRE-SEALED • WATER-PROOF

Projects engineered and cost analyzed from your drawings. Write or phone for detailed information

AMERICAN INSULATED PIPE COMPANY
122 EAST 42 ST. • NEW YORK 17, N. Y. • LE 2-9316

CLASSIFIED ADVERTISING

Classified Section: Rates for classified advertising are 12 cents for each word, including heading and address. One inch $6.00. Count nine words for keyed address. Minimum $2.00 for each insertion. Cash must accompany order.

situations open

Large educational institution in Florida desires Superintendent of heating and power plant. Ability to operate and maintain large oil fired steam generated and distribution plant and other types of heating units required. May design and install heating and power systems. Knowledge of air conditioning and refrigeration desirable. Engineering graduate preferred. In reply state age, experience, education and salary expected. Address Key 964 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

AAA1 manufacturer of air conditioning has important home office opening for sales engineer with managerial qualifications. Successful applicant will be familiar with the application and selection of equipment for large tonnage air conditioning installations. He will be able to assist sales offices in promoting and closing large sales. Minimum requirements include previous experience in the selection and sale of air conditioning or refrigeration equipment and a degree in engineering. Midwest location. Write Key 958 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

EXPORT MANAGER — Leading manufacturer of air conditioning seeks sales engineer to manage established export department. Should be familiar with the application and selection of air conditioning equipment and have some experience in selling through export channels. Engineering degree is preferred. Midwest. Address Key 959 A, Heating, Piping and Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

Sales engineer wanted for Pacific Northwest territory by large national manufacturer of automatic heating equipment — all fuels — warm air and wet heat. Experience selling heating equipment to jobbers or dealers necessary. Please write stating age, experience and salary requirements. Address Key 960 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

We're sorry —

but there are no more January Directory Numbers available until next year.

SAVE THE SMART WAY . . .

Put Those Extra Dollars

in

U. S. SAVINGS BONDS

situations wanted

Graduate Engineer, Carrier trained, age 28, single, 5 years experience in both refrigeration and air conditioning design, sales, application and installation. Ambitious, energetic and sincere. Willing to travel anywhere. Address Key 961 A, Heating, Piping & Air Conditioning, 6 No. Michigan Avenue, Chicago 2, Ill.

Sales Engineer formerly Assistant Sales Manager of nationally known heating and air conditioning manufacturer. Seeks change. Has thorough knowledge of convector, baseboard and wall fin radiation, as well as unit heaters. Has large following among plumbing and heating wholesalers. Territory covered included eastern half of United States. Earnings in 1951 exceeded $20,000. Services available at once. Address Key 962 A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

Heating Engineer, 33, registered M.S., desires opportunity for development and advancement. Six years experience in system design, application and testing. Address Key 963 A Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

wanted

WANTED BACK ISSUES

Up to 3 copies each, Heating, Piping & Air Conditioning Nov. 1934, October 1937, June 1939, March 1941, August 1942, December 1943, August 1944, November 1944, February 1948, October 1948, August 1950. Write stating magazines you have and price wanted. Instituto de la Ciudad Universitaria, 250 West 57th Street, New York 19, N. Y.

for sale

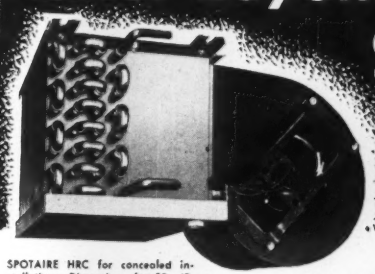
BOILER, OIL BURNER, VACUUM PUMP FOR SALE — Specifications: Kewanee Boiler, Type "C", #1778, Series 2X; Horsepower 40; Steam Radiation 5470 Square Feet; Water Radiation 8750 Square Feet; Maximum Pressure 15 Pounds. Equipped With Delco Oil Burner, Size 34-Type 0. Dunham Return Line Vacuum Pump Size VR 5, Capacity 5000 Square Feet Radiation 40 Pounds Pressure. In Use Approximately 5 Years. A-1 Operating Condition: Available Immediately, Our Shipping Platform, $1500.00. Union-Sun & Journal, Lockport, N. Y.

Quiet Beyond Belief!

SPOTAIRE

Series HRC

ROOM UNIT AIR CONDITIONER



SPOTAIRE HRC for concealed installations. Dimensions for 3R, 4R, and 6R models are the same.

SPOTAIRE HRC UNITS POSSESS SILENCE OF CENTRAL DUCT SYSTEM

HRC UNITS ARE DESIGNED FOR INSTALLATIONS WHERE QUIETNESS IS ESSENTIAL. ACCOMPLISHED BY USING A LARGE FAN REVOLVING AT LOW SPEED. (EXCLUSIVE d-h FEATURE) AND MAY BE SPECIFIED FOR HOSPITALS, MOTELS, HOTELS, APARTMENTS, RESIDENCES, AND OFFICES.

HEATS, COOLS, FILTERS, VENTILATES AND RECIRCULATES AIR. NO DUCT WORK REQUIRED. LOW INITIAL COST. SIMPLE INSTALLATION. THE FINEST ROOM UNIT SYSTEM MADE.

Write for literature

FOR NEW OR OLD CONSTRUCTION

AVAILABLE FOR HOT OR COLD WATER OR DIRECT EXPANSION REFRIGERANT

drayer-hanson

Box 2215 Terminal Annex

Los Angeles 54, California

INDEX TO ADVERTISERS

A-J Mfg. Co. *
Acme Industries, Inc. 56
Aerco Corp. *
Aerofin Corp. 223
Air Devices, Inc. 9
Air-Maze Corp. *
Airtex Corp. 270
Airtherm Mfg. Co. *
Aladdin Heating Corp. *
Alco Valve Co. 18
Aldrich Co. 245
Allen-Bradley Co. 62
Allis-Chalmers Mfg. Co. 10, 11, 203
Alloy Steel Products Co., Inc. 15
Alstrom Corp., The 255
American Air Filter Co. 206 & 207
American Blower Corp. 35
American Brass Corp., The *
American Chain & Cable Co., The *
American Hair & Felt Co. 247
American Insulated Pipe Co. 270
American Radiator & Standard Sanitary Corp. 173
Ames Iron Works *
Anderson Co., V. D. 47
Anemostat Corp. of America 225
Armstrong Cork Co. 176
Armstrong Machine Works 189
Ashcraft Co. 267
Atlas Mfg. Co. 248
Auer Register Co. 266
Aurora Pump Co. 265
Autorad, Inc. 242

Babcock & Wilcox Co. 64
Badger Manufacturing Co. 222
Barber-Colman Co. 215
Barnes & Jones, Inc. 224
Bayley Blower Co. 229
Bell & Gossett Co. 8, 17
Bertram Co., The, Harvey P. 228
Biglin Company, Inc., H. C.
Binks Mfg. Co. 254
Bishop & Babcock Mfg. Co., The 263
Bituminous Coal Institute 38
Black & Decker Mfg. Co. *
Blaw-Knox Corporation 234
Bonney Forge & Tool Works 34
Boyle-Midway Inc.
(American Home Products Corp.) 167
Breidert Co., G. C. 247
Bryant Heater Div., Affiliated Gas Equip. 158
Bruner Corp., The *
Brunner Mfg. Co. 67
Buffalo Forge Co. 42 & 43
Buffalo Pumps, Inc. 239
Bullard Co., The 205
Bundy Tubing Co. 45
Burnham Corporation *
Bush Mfg. Co. 4
Byers Co., A. M. *

Campbell Heating Co. 51
Carey Co., Philip, The *
Carnes Co., W. R. 213
Carrier Corp. 46
Cash Co., A. W. 219
Century Electric Co. 165
Chase Brass & Copper Co. *
Chester Cable Corp. 236
Chicago Pump Co. *
Clarage Fan Co. Inside Back Cover
Clark Mfg. Co. *
Cleaver-Brooks Co. 239
Combustion Engineering—
Superheater Inc. 154
Comfort Products 157
Committee on Steel Pipe Research of American Iron & Steel Institute *
Connor Engrg. Co., W. B. 53, 59
Continental Air Filters, Inc. 217
Copeland Refrigeration Corp. 190
Crane Co. 55
Crocker-Wheeler Div., Elliott Co. 49
Curtis Refrigerating Machine Co. 31
Cyclotherm Corp. *

Davis Engineering Corp. 267
De Bothezat Fans Division
American Machine & Metals, Inc. 201
De Laval Steam Turbine Co. 209
Delavan Mfg. Co. 265
Delco Prods. Div., General Motors Corp. 180
Detroit Lubricator Company *
Detroit Stoker Co. 7
Dodge Mfg. Co. *
Dole Refrigerating Co. *
Dollinger Corp. *
Dravo Corp. *
Drayer-Hansen Co. 271
Dunham Co., C. A. 204
Durant Insulated Pipe Co. 214
Dutton Boiler Div., Hapman-Dutton Co. 202

Eagan Co., Inc., Walter H. *
Eclipse Fuel Engrg. Co. *
Economy Pumps, Inc. *
Emerson Elec. Mfg. Co. *

Farr Co. 6
Fedders-Quigan Corp. *
Field Control Div., H. D. Conkey & Co. 174
Fisher Governor Co. 192
Fitzgibbons Boiler Co., Inc. 149
Fluid Systems, Inc. *
Foster Wheeler Corp. *
Fulton Sylphon Co. 37
Frick Co. 240

G. & O. Mfg. Co., The 266
Gallaher Co. 241
General Blower Corp. 195
General Controls Co. *
General Electric Co. *
Gerstein & Cooper, Inc. *
Glasfloss Corp., The *
Globe Steel Tubes Co. 194
Goulds Pumps, Inc. 268
Governair Corp. 262
Grabler Mfg. Co. *
Greenlee Tool Co. 241
Grinnell Co., Inc. Inside Front Cover

Hajoca Corporation *
Hart Mfg. Co. *
Hamilton-Thomas Corp. *
Handy & Harman *
Hastings Instrument Co. 244
Hayes Furnace & Mfg. Co., Inc. 30
Heil Process Equipment Corp. *
Hendrick Mfg. Co. 246
Henry Valve Co. *
Hershey Machine & Foundry Co. *
Hoffman Specialty Co. 33
Hoover Co., Div., Kingston-Conley *
Howell Electric Motors Co. *
Hussey & Co., C. G. *

Ilg Electric Ventilating Co. 183
Illinois Engineering Co. 188
Illinois Testing Laboratories, Inc. *
Independent Register Co. 208
Industrial Acoustics Co., Inc. 268
Industrial Sound Control Inc. 255
Infra Insulation, Inc. 199
Ingersoll-Rand 162
Iron Fireman Mfg. Co. *

Jackson & Church Co. 186
Jefferson Union Co., Inc. *
Jenkins Bros. 196
Jenn Air Products Co. *
Johns-Manville 187, 262
Johnson Co., S. T. *
Johnson Service Co. Outside Back Cover
Joy Mfg. Co. 181

Keasbey & Mattison Co. *
Kennard Corp. 233
Kennedy Valve Mfg. Co., The 58
Kewanee Boiler Corp. 28
Key Co. 268
Klipfel Valves, Inc. *
Korfund Co., Inc., The 258
Kramer Trenton Co. 249
Kritzer Radiant Coils, Inc. 155

Ladish Co. *
La Harco Industries *
Lake Chemical Co. *
Lee Corporation, The 238
Leslie Co. 182
Lincoln Electric Co., The *
Lunkenheimer Co., The *

Maid-O'-Mist, Inc. *
Malleable Iron Fittings Co. 48
Manning & Lewis Engineering Co. 257
Marley Co., The 156, 264
Marlo Coil Co. 150 & 151
Marsh Heating Equipment Co. *
McCord Corp. 230
McDonnell & Miller, Inc. 57
McQuay, Inc. 27
Mercoid Corp., The *
Metal Goods Corp. 221
Mettler Co., Inc., The 267
Mid-Continent Metal Products Co. 250
Midwest Piping & Supply Co. 177
Mineralac Electric Co. *
Minneapolis-Honeywell Regulator Co. 24 & 25
Miracle Adhesives Corp. 266
Mitchell Co., John E. *
Modine Mfg. Co. 22
Muckle Mfg. Co. 264
Mueller Brass Co. *
Mueller Furnace Co., L. J. *
Multi-Vent Div., Pyle National Co. *
Mund Boilers, Inc. *
Mundet Cork Co. 60
Murray Co. of Texas, The *
Mystik Adhesives Products *

Nash Engineering Co. 72
National Tube Div.,
United States Steel Corp. 32
Nelson, Herman Div. of American Air Filter Co., Inc. *
Nesbitt, Inc., J. J. 68
New York Blower Co., The 63
Niagara Blower Co. *
Nicholson & Co., W. H. 264

Ohio Brass Co. 184
Ohio Injector Co. 57
Olson & Company, Arthur A. *
Orr & Sembower, Inc. *
Owens-Corning Fiberglas Corp. *

Packless Metal Products Corp. *
Paragon Electric Co. 270
Patterson-Kelley Co., Inc., The 166
Peerless Elec. Co. *
Peerless Pump Div., Food Machinery & Chemical Corp. 164
Penn Controls, Inc. 179
Penn Ventilator Co. *
Perfex Corp. 242
Pittsburgh Corning Corp. *
Porter & Co., H. W. 243
Powell Co., The Wm. 159
Powers Regulator Co., The 39
Prat Daniel Corp., Thermobloc Div. 220
Preferred Utilities Mfg. Co. *
Pritchard Co., J. F. *
Propellair, Inc. *
Pur Air Div.,
American Solvent & Recovery Corp. 231
Pyle-National Co., The 50

Quijada Tool Co., Inc. *

R P & C Division American Chain & Cable Co., The *
Ramset Fasteners, Inc. *
Reading Tube Corp. *
Ready-Power Co., The 252
Refinite Corp. *
Register & Grille Mfg. Co. 218
Remington Air Conditioning 270
Rempe Co. 263
Republic Steel Corp. *
Revere Copper & Brass, Inc. 71
Reznor Manufacturing Co. *
Ric-wiL Co., The *
Ridge Tool Co. 212
Rockwell Co., W. S. 267
Rome-Turney Radiator Co. 265
Rubber & Plastics Compound Co. *
Ruppright's Rotary Roof Cooler *

Sarco Co., Inc. 235
Sarcotherm Controls, Inc. 14
Schaub Engineering Co., Fred H. *
Servel, Inc. 163
Siemon & Co. *
Skidmore Pumps 245, 257
Skilsaw, Inc. *
Smith Co., Inc., H. B., The *
Spang-Chalfant Div. of The National Supply Co. 29
Spence Engineering Co., Inc. 44
Spencer Heater, Avco Mfg. Corp. 227
Sporlan Valve Co. *
Spraying Systems Co. 269
Standard Stamping & Perforating Co. 169
Steco Products *
Stephens-Adamson Mfg. Co. 41
Sterling Electric Motors 260
Sterling, Inc. 232
Stewart Mfg. Co. 263
Stic-Klip Mfg. Co. *
Superior Combustion Industries, Inc. 153
Surface Combustion Corp. 259
Swartwout Co. *

Taco Heaters, Inc. 54
Taylor Forge & Pipe Works 26
Taylor Instrument Cos. *
Thrush & Co., H. A. 168
Titus Mfg. Corp. 161
Titusville Iron Works Co., The, Div. of Struthers Wells Corp. 216
Trane Co., The *
Trerice Co., H. O. 269
Trindl Products, Ltd. *
Truscon Steel Co. 269
Tube Turns, Inc. *
Tuttle & Bailey, Inc. *
Typhoon Air Conditioning Co. *

Union Asbestos & Rubber Co. 210, 211
Unistrut Products Corp. Facing 180
United Cooling Tower Co. 226
United Electric Controls Co. 263
United States Air Conditioning Co. 3
United States Gauge Div.,
American Machine & Metals, Inc. 191
United States Steel Co. 32, 172
United States Steel Co. (U. S. Supply) 172
Universal Diffusers Corp. *
Utility Appliance Corp. 61

Vilter Manufacturing Co., The *
Vulcan Radiator Co. *

Wagner Electric Corp. 170
Waldron Corp., John *
Walworth Co. 40
Ward Leonard Elec. Co. 160
Waterman Waterbury Co., The 261
Watson-Stillman Co. 152
Webster & Co., Warren 12 & 13
Webster Engineering Co. 256
Weil Pump Co. *
Welding Fittings Corp. *
Western Engineering & Mfg. Co. 265
Westinghouse Electric Corp.,
Air Conditioning Div. *
Westinghouse Electric Corp. 20
Weston Electrical Instrument Corp. *
Wheatland Steel Products Co. 178
Wheeler Mfg. Co., C. H. *
White-Rodgers Electric Co. 185
Whitlock Mfg. Co. 258
Wiegand Co., Edwin L. *
Will-Burt Company, The *
Williams Valve Co., D. T., Div. of The Schaible Co. *
Wilson & Co. 235
Wilson, Inc., Grant Facing 181
Wing Mfg. Co., L. J. 175
Wolverine Tube Div. of Calumet & Hecla Consolidated Copper Co. 23
Worthington Corp. 19

Yarnall-Waring Co. 237
Yates-American Machine Co. 269
York Corporation 171
York-Shipley 237
Young Radiator Co. 16
Youngstown Sheet & Tube Co. 36

Zallea Bros. *
Zonolite Co. *
Zurn Mfg. Co., J. A. 21

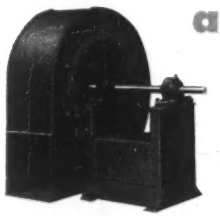
Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in other issues is marked with an asterisk.

You Can Rely on Clarage

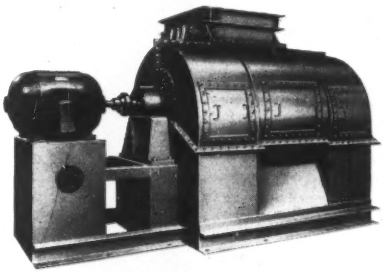
. . . . to meet all types of industrial, power plant, commercial and public building requirements.

CLARAGE

The Sign of Resourceful Engineering and Economical Performance



INDUSTRIAL FANS—for blowing or exhausting. Large range of capacity sizes—suitable for many applications.



MECHANICAL DRAFT FANS—both forced and induced draft. Heavy-duty construction for continuous operation at peak loads.

CAST IRON FANS—for industrial services. Unique construction assures extra long life when handling corrosive gases.

What you're looking for in air handling and air conditioning you are likely to find at Clarage Fan . . . highly efficient, dependable equipment — job engineered to your particular needs . . .

It's nearly 40 years since we started building fans, blowers and allied products. We have had ample time to temper research with experience, engineering with sound practice, manufacturing to actual operating in-the-field demands . . . .

You can profit by dealing with Clarage. We have an established reputation for getting things done right . . . . As evidence of what we mean, 97 of the 100 largest American corporations are users of Clarage fan equipment. Need we say more?

CLARAGE FAN COMPANY

627 PORTER ST., KALAMAZOO, MICH.

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: **4285 Richelieu St., Montreal**
Canada Fans, Ltd.

HEADQUARTERS FOR AIR HANDLING AND CONDITIONING EQUIPMENT

Good Samaritan Hospital, Los Angeles, Calif.
Lunden, Hayward & O'Connor, architects;
Ralph E. Phillips, mechanical engineer;
Howe Bros., heating contractors; Los Angeles

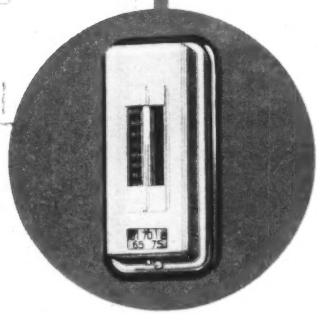
On 24-hour duty

IN HOSPITALS

JOHNSON

AUTOMATIC TEMPERATURE CONTROL

for labor-saving comfort and safety



In the thoroughly up-to-date Good Samaritan Hospital in Los Angeles, 70 Johnson *Individual Room Control* Thermostats are on "24-hour duty," working around-the-clock to maintain precisely the proper temperatures for every purpose. The room thermostats operate Johnson mixing dampers at the double "tempered and warm air" plenum chambers of the 15 central-fan heating systems in the building. "Behind the scenes," other Johnson instruments, valves and dampers are on continuous duty, so that the temperatures of the air, for heating and for ventilation, are controlled at exactly the right levels in those plenums.

With Johnson Automatic Control in command, hospital personnel are relieved of such oft-recurring chores as operating radiator valves and checking room temperatures. Assured of comfort and safety for patients, the staff is free to devote more time to professional duties . . . and with added energy—thanks to Johnson Temperature and Humidity Control.

Johnson Control meets the most exacting safety requirements. *Pneumatically* operated, it is always safe, even in the presence of explosive anesthetic gases. Also, Johnson Humidity Control guards against the dangers of static electricity.

Whether the problem involves control of temperatures and humidities in a single operating room or an entire hospital, call a Johnson engineer from a nearby Branch Office. His advice is yours for the asking. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURE • APPLICATION • INSTALLATION • SINCE 1885